DRAFT VAPOR INTRUSION MITIGATION INSTALLATION REPORT 4TH AND GAMBELL ANCHORAGE, ALASKA

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APPROVAL PAGE

This installation report for constructing vapor intrusion mitigation systems in four residences at the 4th and Gambell site in Anchorage, Alaska has been prepared for the U.S. Environmental Protection Agency, on behalf of Environmental Quality Management, by Ahtna Engineering Services, LLC, with support from their teaming partners Rescon Alaska, LLC and Geosyntec Consultants, Inc.

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TABLE OF CONTENTS

<u>TABLES – IN TEXT</u>

TABLES – APPENDED

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AAC ....Alaska Administrative Code
ADEC.............Alaska Department of Environmental Conservation
Ahtna..............Ahtna Engineering Services, LLC
bgs ....below ground surface
CERCLA........Comprehensive Environmental Response, Compensation, and Liability Act
COC ....contaminant of concern
DCE................dichloroethene
E&E................Ecology and Environment
EPA ....Environmental Protection Agency
EQ ....Environmental Quality Management, Inc.
HEPA ....high-efficiency particulate air
ID ....identification
IDW................investigation-derived waste
inWC..............inches of water column
ITRC ....Interstate Technology and Regulatory Council
$\mu g/m^3$.............microgram per cubic meter
mg/kg ....milligram per kilogram
mg/L...............milligram per liter
MM&R...........monitoring, maintenance, and repair
OASIS ....OASIS Environmental, Inc.
PCE ....tetrachloroethene
pCi/L ....picoCuries per liter
PVC................polyvinyl chloride
ROI.................radius of influence
SDG................sample delivery group
SMD...............sub-membrane depressurization
SSD ....sub-slab depressurization
TCE................trichloroethene
TWA ....time-weighted average
US ....United States
VMP...............vapor monitoring point
VOCs..............volatile organic compounds
% ....percent

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1.0 INTRODUCTION

Ahtna Engineering Services, LLC (Ahtna) has developed this Vapor Intrusion Mitigation Installation Report on behalf of Environmental Quality Management, Inc. (EQ) to detail the installation of vapor mitigation systems at four residential structures located within the 4th and Gambell chlorinated solvent impacted area in Anchorage, Alaska. The task was authorized by the United States (US) Environmental Protection Agency (EPA) under Contract EP-S7-13-02. A field team consisting of qualified professionals from Ahtna, Rescon Alaska, LLC, and Geosyntec Consultants, Inc. performed the mitigation system installations. The major tasks performed as part of the systems installation effort included the following:

- Removal of a previously installed sub-membrane depressurization (SMD) system in the crawlspaces of two of the project area buildings.
- Movement of select personal belongings out of construction areas to temporary storage areas.
- Installation of vapor barriers in the crawlspaces.
- Application of a vapor intrusion coating system, Retro-Coat™, in one building.
- Construction of SMD systems beneath the vapor barriers.
- Installation of sub-slab depressurization (SSD) wells
- Construction of exhaust stack piping for the SMD and SSD systems.
- Collection of indoor air confirmation samples to assess effectiveness of passive systems.
- Converting two of the systems from passive to active mitigation systems by installing electric fans.
- Insulation of the active system exhaust stacks.
- Collection of indoor air confirmation samples to assess effectiveness of active systems.

Figure 1 presents a site location map and Figure 2 presents a site plan of the project area. This report provides a description of the mitigation system installations, a presentation of the analytical air monitoring results, conclusions and recommendations, and a Maintenance, Monitoring, and Repair (MM&R) Plan for the systems.

1.1 Project Remedial Objectives

The primary objective of this project was to design and install vapor intrusion mitigation systems that reduce contaminant vapors in the buildings to concentrations less than the respective Alaska Department of Environmental (ADEC) target levels for residential indoor air. The secondary objectives for the project were to install cost effective systems that were easy for property owners to operate and maintain and provide long-term sustained operation until the chlorinated solvent source area at this site is remediated.

1.2 Site Description and Background

The 4th and Gambell site, also known as Alaska Real Estate Parking Lot, is located in downtown Anchorage, Alaska at 717 East 4th Avenue, approximately 1.3 miles east of Cook Inlet's Knik

Arm (Figure 1). The source area is bounded to the north by East 3rd Avenue, to the south by East 4th Avenue, to the west by Gambell Street, and to the east by Hyder Street. The approximate location is latitude 61° 13’ 9.3396” north and longitude -149° 52' 13.5732” west within Section 18, Township 13 North, and Range 3 West of the Seward Meridian.

The 4th and Gambell source area is comprised of several municipal lots spanning approximately one acre in size. The immediate vicinity is generally flat with an elevation of approximately 110 feet above mean sea level. The surrounding area has a gentle slope to the north towards Ship Creek. Approximately 700 feet to the north of the site, the terrain terminates into a bluff that descends sharply toward the Ship Creek drainage 60 to 70 feet below.

1.3 Site Characteristics

The 4th and Gambell site is surrounded by commercial, retail, and residential properties. This project is focused on four residential buildings north of the former dry cleaning facility, C&K Sanitary Cleaners, as shown in Figure 2.

The southern portion of the site area is currently an undeveloped parking lot that was previously occupied by a variety of businesses, including New Method Cleaners in approximately 1955, C&K Sanitary Cleaners from 1968 to 1970, and NC Auto Services Center from 1976 to 1978. All of the buildings in this portion of the site were removed by 1978. A communications tower/antennae located at the southeast corner of is owned by Alaska Communications. The legal description for this one-half city block is Lot 8A, Lot 10, Lot 11, and Lot 12, Block 26A, East Addition. All of these lots are currently owned by Fourth and Gambell LLC.

The northern portion of the site area contains single and multi-family residences. The legal description for this one-half city block is Lot 1, Lot 2, Lot 3, Lot 4, Lot 5, and Lot 6A, Block 26A, East Addition. Lots 1, 2, 3, and 4 are owned by (b) (6) [redacted] and Lots 5 and 6A are owned by (b) (6) [redacted] The four properties requiring mitigation are in these lots, located at 710 East 3rd Avenue, 720 East 3rd Avenue, and the north and south duplexes at 736 East 3rd Avenue (hereafter “North Duplex” and “South Duplex”). East 3rd Avenue and the former Alaska Native Hospital property, which is now vacant, are located to the north beyond the residential buildings.

The primary contaminants of concern (COCs) for the 4th and Gambell site are tetrachloroethene (PCE) and its degradation products trichloroethene (TCE), dichloroethene (DCE) isomers, and vinyl chloride. The site COCs belong to a category of contaminants known as volatile organic compounds (VOCs) that are considered a hazardous substance or pollutant or contaminant as defined by sections 101(14) and 101(33) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended 42 United States Code § 9601(14) and (33). The likely source of the PCE contamination is presumably the former dry cleaners. PCE is widely utilized in dry-cleaning processes, and environmental releases from spills or improper disposal are common from historical dry-cleaning businesses.

1.4 Previous Investigations and Remedial Actions

Site investigation work has been performed at the site since 1993. Several environmental investigations were performed at the site between 1993 and 2008 to assess the nature and extent of contamination, but indoor air was not assessed until 2009 and 2010. Target levels at that time were more stringent for PCE and TCE than the target levels in 2014. Table 1-1 shows the changes in target levels for air.

TABLE 1-1: ADEC CHANGES TO RESIDENTIAL TARGET LEVELS FOR AIR

Compound	Target Level for Residential Shallow Soil Gas (µg/m³)		Target Level for Residential Indoor Air (µg/m³)	
	Pre-2012	Post-2012	Pre-2012	Post-2012
PCE	40	420	4.1	42
TCE	2.2	21	0.22	2.1
cis-DCE	370	73	37	7.3
trans-DCE	630	630	63	63
Vinyl Chloride	8.1	16	0.81	1.6

Key:
µg/m³ micrograms per cubic meter

The two most recent vapor intrusion investigations are summarized in the following sections.

1.4.1 2009-2010 – ADEC Vapor Assessment

OASIS Environmental, Inc. performed additional site characterization and sampling in 2009 and 2010 with the inclusion of vapor intrusion assessments at four residential buildings located on Lots 1-6, Block 26A East Addition just north of the Alaska Real Estate Parking Lot (710 East Third, 720 East Third, North Duplex, South Duplex). The assessments included the collection of soil gas samples, outdoor air samples outside each building, and the collection of either indoor air or crawl space air samples four times (March 2009, June 2009, February 2010, and May 2010). Analytical results from the four assessments indicated that PCE was present in soil gas at concentrations exceeding the historical ADEC target soil gas level of 40 µg/m³ at all four residences for all four sampling events. However, compared to the current target level of 420 µg/m³, only the residence at 720 E. Third exceeded the target levels for all four sampling events, and the South Duplex exceeded the target soil gas level only during the two summer sampling events.

In addition, indoor air or crawl space analytical results showed that PCE was present at concentrations greater than the historical ADEC indoor air target level of 4.1 µg/m³ at all four residences. However, compared to the current target level of 42 µg/m³, only the residences at 720 E. Third and the North Duplex exceeded the target levels. These findings indicated that PCE was present in the residences at concentrations, likely as a result of vapor intrusion (OASIS, 2009).

A passive soil gas survey was also performed for the four-block area between Third and Fourth Avenues and between Gambell and Ingra Streets. The passive soil gas results showed that elevated PCE concentrations occur around the former C&K Cleaners and extend to the four residences. Elevated concentrations of PCE were also detected adjacent to the PIP Printing and First Native Baptist Church buildings, located one block east of the site (OASIS, 2010a).

1.4.2 July 2012 – EPA Site Inspection

In 2012, the EPA contracted Ecology and Environment (E&E) to further characterize the source and extent of contamination previously observed at the C&K Cleaners and surrounding locations. E&E advanced 13 soil borings that were sampled at five foot intervals and of which 12 were completed as temporary monitoring wells (BH01GW through BH12MW). Additionally 31 surface soil, 10 soil gas, 12 indoor, 8 outdoor air, and 10 sediment samples were collected and analyzed for VOCs. Electromagnetic and ground penetrating radar was used to locate buried drums and wooden cribs. A brief summary of the investigation work performed at the site is provided below (E&E, 2013).

- Soil samples from several boreholes (BH01, BH02, BH03, BH05, BH07, BH08, and BH09) located near the former C&K Cleaners reported elevated concentration of PCE at varying depths down to 50 feet below ground surface (bgs) (maximum depth sampled). The 45-50 feet bgs soil sample from BH11 (located on the former Native Hospital site north of Third Avenue) contained 0.15 mg/kg of PCE.
- PCE was reported in groundwater at concentrations greater than the cleanup level of 0.005 mg/L in eight of the groundwater monitoring wells sampled with PCE concentrations ranging from 0.0078 to 8.5 mg/L. PCE was not observed in the only groundwater sample (BH12) taken north of Third Avenue, but this sample had an elevated reporting limit. No groundwater sample was collected at BH11 but the soil contamination and previous groundwater monitoring results show that PCE is present at this location.
- Four of the indoor air samples showed concentrations exceeding the historical ADEC indoor air target level of 4.1 $\mu g/m^3$ in the North and South Duplex buildings. However, only the North Duplex had samples exceeding the current target level of 42 $\mu g/m^3$.
- Two of the soil samples located near the former C&K Cleaners had PCE concentrations that exceeded the ADEC soil cleanup level of 0.024 mg/kg for migration to groundwater.
- Ten sediment samples collected from along Ship Creek had concentrations that were less than the reporting limit for PCE.

1.4.3 Other Actions to Date

No remedial actions have been taken to date to reduce groundwater contamination, which would likely have the effect of reducing the risk of vapor intrusion.

One remedial/protective action has been taken at the site to prevent indoor air impacts to residents in four buildings located near the site. Between March and June 2009, SMD systems were installed in the crawl spaces for the North and South Duplexes at 736 East Third Avenue by the building owner (OASIS, 2010b). ADEC continued to monitor the crawlspace air at both of these duplex locations during vapor intrusion sampling events performed in June 2009, February

2010, and May 2010. PCE concentrations were reduced, but an inspection of the systems conducted in November 2010 found that a foundation slab in the North Duplex was not being depressurized (ADEC, 2014b). Subsequent indoor air sampling showed that the concentrations were still greater than the target levels. In summer 2013, the EPA and ADEC met to discuss mitigating the vapor intrusion pathway to reduce risk to residents.

At the time of this installation effort, the owner-installed SMD systems were still in place. However, only the North Duplex's depressurization system was operating at the time.

1.5 Scope of Work

Ahtna performed the following scope of work to meet the project objectives:

- Organized and assisted with the safe removal and temporary storage of tenants' belongings until the installation of the mitigation systems was completed.
- Collected pre-installation radon samples from each building.
- Installed passive vapor mitigation systems in the four subject buildings.
- Collected post-installation radon samples from each building.
- Collected post-installation 24-hour indoor air samples for COCs to assess the effectiveness of the passive mitigation systems.
- Converted the passive systems to active systems at two of the residences by installing active mitigation fans.
- Collected 24-hour indoor air samples for COCs to assess the effectiveness of the active mitigation systems.
- Documented site conditions, installation procedures, and any variations from the project design plan.

1.6 Relevant Regulations and Guidance Documents

The following relevant regulations and guidance documents were used and referenced throughout this project:

- ADEC Vapor Intrusion Guidance for Contaminated Sites, dated October 2012
- EPA, OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), dated November 2002
- EPA Indoor Air Vapor Intrusion Mitigation Approaches, Engineering Issue, EPA/600/R-08-115, dated October 2008
- Interstate Technology Regulatory Council (ITRC) Vapor Intrusion Pathway: A Practical Guideline, dated January 2007
- Article 3, Chapter 75, Title 18 of the Alaska Administrative Code (AAC), dated October 2014

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2.0 MITIGATION SYSTEM INSTALLATIONS

Passive vapor intrusion mitigation systems were initially installed at each of the four properties between May 12 and 27, 2014 in accordance with the approved Design Plan dated May 12, 2014. The specific installation in each building varied based on the size and layout of each structure. However, the basic approach of mitigation in each building was similar: to block the intrusion of vapors in the buildings using vapor barriers and to remove the accumulated vapors by providing preferential pathways out of the building.

After completion of the passive system construction, 24-hour indoor air samples were collected from each of the buildings to confirm system effectiveness. Sample results confirmed that ADEC residential indoor air target levels for the site COCs were achieved at 710 East 3rd Avenue and the South Duplex. However, the indoor air concentrations at 720 East 3rd and the North Duplex were still elevated above residential indoor air target levels.

A design modification was submitted to the EPA in September 2014 to install active vapor intrusion mitigation systems at 720 East 3rd and the North Duplex. Electric mitigation fans were then installed at the two buildings between October 1 and 3, 2014 to convert the passive systems to active systems. An additional round of 24-hour indoor air samples was collected from the two buildings to confirm the effectiveness of the active mitigation systems. Sample results confirmed that the ADEC residential indoor air target levels for the site COCs were achieved at 720 East 3rd Avenue and the North Duplex.

The following sections detail the mitigation system installations for each building, along with any deviations from the original design plan. Field notes are provided in Appendix A. Photographs are provided in Appendix B. Cut sheets on product specifications are provided in Appendix C.

2.1 710 East 3rd Avenue

The 710 East 3rd Avenue house is constructed on a foundation that contains a basement with a concrete slab and a dirt floor crawlspace. A combination of vapor barrier with passive SMD in the crawlspace and passive SSD beneath the basement floor was used to mitigate vapor intrusion of contaminants in the building. The mitigation system layout at 710 East 3rd Avenue is shown on Figure 3.

All personal belongings located in the crawlspace areas of the building and in the vicinity of the depressurization wells were removed prior to the start of installation activities and placed in the basement. Photos were taken during the moving to document the condition of items. The homeowner cleaned out the basement over the weekend during the construction effort and removed from the home almost all of the materials that had been moved from the crawlspace to the basement.

2.1.1 SSD System

An SSD system was installed throughout the basement of the house. During the installation, it was found that no concrete slab was present beneath the northwest portion of the basement (the

"Common Area" in Figure 3). The floor in that area is constructed of a plywood sub-floor on wood framing that is covered by carpet. Approximately 8-inches of void space separated the plywood floor from the underlying soil. Two of the SSD wells were located in this area. The top of the 12-inch polyvinyl chloride (PVC) screen intervals were installed approximately 6-inches below the plywood floor (10-inches of the screen were buried with 2-inches above the soil). The well casing was sealed to the plywood floor using construction adhesive. A layer of vapor-tight caulking was applied over the construction adhesive once it had cured. A third SSD well was installed through the concrete slab near the stairwell on the south end of the house.

The locations of the SSD wells in this house (typical to all four houses) were determined based on the following objectives: to provide minimal disruption to the building owners (i.e. along interior walls, behind doors, in corners), to reduce the risk of damage to the piping, and to achieve spatial coverage that maximized the extraction capability. Ahtna personnel installed the 2-inch diameter extraction wells using a rotary hammer drill to penetrate the concrete slab in areas where a slab was present. A hole-saw was used to penetrate the subfloor in areas where a concrete slab was not present. The hammer drill was also used to loosen the fill material beneath the slab. A high-efficiency particulate air (HEPA) vacuum was used to remove soil cuttings down to a depth of approximately 12-inches below the concrete slab.

The SSD wells were constructed of a 12-inch section of 0.020-inch slot screen that was bedded in 8-12 silica sand. The well riser was sealed to the concrete slab with a low VOC and vapor tight construction epoxy. Construction adhesive and vapor tight caulk was used for wells installed through the subfloor where a concrete slab was not present. Figure 7 shows a detail of how the sub-slab depressurization wells were constructed. *Note: SSD installation methods and construction were the same for the other three project houses.*

Each depressurization well was routed through 2-inch diameter rigid Schedule 80 PVC conveyance piping to a common header made of 4-inch diameter Schedule 80 PVC. The header piping was routed through the exterior wall to a common 4-inch diameter exhaust stack on the west wall of the house. The exhaust stack was routed vertically up the side of the house and extended a minimum of 2-feet above the edge of the roof. The exhaust stack is constructed of 4-inch diameter Schedule 80 PVC piping that is connected to the building using Unistrut and Unistrut clamps. A wind turbine was affixed to the top of the stack to promote airflow during wind events. The exhaust stack was constructed with a drainage sump at the base that was fitted with a 1/4-inch diameter, quarter-turn ball valve that can be opened to drain accumulated water, if any, from the stack.

2.1.2 SMD System

An SMD system was installed in the L-shaped crawlspace along the north and east sides of the house. Two sections of 4-inch diameter perforated PVC piping were installed on the floor of the crawlspace. The perforated PVC was attached to 4-inch Schedule 80 PVC conveyance piping that was routed through an exterior wall to a common exhaust stack on the north side of the building. A 10-mil thick VaporFlex® vapor barrier was installed along the floor and exterior walls of the crawlspace over the perforated PVC piping. The vapor barrier was sealed to the foundation walls using Eternabond® double-sided liner tape. Additionally, plastic vapor barrier anchors were installed in the concrete wall approximately every 4-feet to support the weight of the vertical vapor barrier sections. Any seams in the vapor barrier were overlapped by a minimum of one foot and were sealed with vapor barrier tape. The SMD exhaust stack was routed vertically up the north side of the house and was constructed of 4-inch diameter, Schedule 80 PVC piping. The stack was connected to the side of the building using Unistrut and Unistrut clamps. A wind turbine ventilation fan was affixed to the top of the stack to promote airflow during wind events.

The property owner of the 710 East 3rd Avenue residence utilizes the crawlspace areas in the building for storing of personal items. To accommodate the continued use of the areas for storage and to protect the vapor barrier and piping, Ahtna installed plywood platforms in the crawlspaces. The platforms were constructed in 4-foot sections and were built with 5/8-inch thick plywood. The plywood was framed on top of 2-inch by 6-inch lumber in order to span across the 4-inch diameter perforated PVC. The 4-foot platforms were screwed together for stability.

2.1.3 Concrete Slab Sealing

Upon further inspection, significant voids or cracks in the concrete slab and foundation walls were not observed that required concrete patching. A sewer cleanout was located in the center of the room that could potentially be a vapor pathway. However, sealing the cleanout was not possible without rendering it unusable for the homeowner. Therefore, no concrete slab sealing was conducted.

2.2 720 East 3rd Avenue

The 720 East 3rd Avenue house has a basement constructed on a concrete block foundation with a concrete slab. An addition with a crawlspace supported by posts was added on the north side of the building. No access or ventilation is present between the basement and the north crawlspace. During the installation effort a second crawlspace area was discovered beneath the entryway on the east side of the stairwell. A combination of concrete crack repair, active SSD, active SMD, and passive crawlspace ventilation was used to mitigate vapor intrusion of contaminants in this building. The mitigation system layout at 720 East 3rd Avenue is shown on Figure 4.

2.2.1 SSD System

A sub-slab depressurization system was installed throughout the basement of the house. Three 2-inch diameter depressurization wells were distributed throughout the basement using an assumed 10-foot radius of influence (ROI) around each well. The conservative 10-foot ROI was originally planned for the system in a passive mode and will be very effective with the system in an active mode. Each depressurization well was routed through 2-inch diameter rigid Schedule 80 PVC conveyance piping. For each SSD well, a PVC ball valve and analog manometer were installed to regulate and measure the flow and vacuum levels, respectively, in each well. Each SSD well also has a sample port for testing exhaust air. The 2-inch conveyance lines were routed to a common header made of 4-inch diameter Schedule 80 PVC. The header piping was routed to a common 4-inch diameter exhaust stack on the east wall of the house. Additionally, a floor drain, located in the center of the laundry room, was sealed with a removable compression plug.

The exterior SSD exhaust stack was routed vertically up the east wall of the building and is constructed of 4-inch diameter Schedule 80 PVC piping. The stack is connected to the side of the building using Unistrut and Unistrut clamps and extends 2-feet above the side of the house. An in-line RadonAway GP501 mitigation fan was installed in the exterior exhaust stack. A condensation diverter fitting was installed immediately above the fan to protect it from corrosion. The exhaust stack was insulated with 3/4-inch closed-cell foam insulation that was wrapped with rigid aluminum jacketing for weather protection. A PVC weather cap was installed on the top of the exhaust stack to prevent precipitation accumulation in the stack. The exhaust stack was constructed with a drainage sump at the base that was fitted with a 1/4-inch diameter, quarter-turn ball valve that can be opened to drain accumulated water, if any, from the stack.

One vapor monitoring point (VMP) was installed through the concrete slab in the hallway of the basement. The location is centrally located between the SSD wells and located close to an interior wall to minimize foot traffic near the VMP. The VMP is constructed of a 1/4-inch brass Vapor Pin. The top of the Vapor Pin is recessed below the top of the concrete slab to prevent damage and tripping. However, the concrete slab was too thin to allow adding a locking cap.

2.2.2 SMD System

A secondary crawlspace area was discovered during the installation effort beneath the entryway to the residence on the south side of the house. The approximate 11-foot by 5-foot, dirt floor secondary crawlspace is located to the east of the stairwell as shown on Figure 4. A wooden storage platform is constructed between the first and second levels of the house on the west side of the stairwell. A test hole was drilled through the wood that confirmed soil is present under the wood.

An SMD system was installed in the secondary crawlspace to mitigate the vapor intrusion exposure from the exposed soil. One 10-foot section of 4-inch diameter perforated PVC piping was installed north-south along the floor of the crawlspace. A 10-mil thick VaporFlex® vapor barrier was installed over the perforated PVC piping. The vapor barrier was sealed to the foundation walls using either Permalon® double-sided liner tape or Eternabond® tape in areas where Permalon® was not adhering. Additionally, plastic vapor barrier anchors were installed in the concrete wall approximately every 18-inches to support the weight of the vertical vapor barrier sections. The perforated PVC was attached to 4-inch Schedule 80 PVC conveyance piping that was routed to the west over the wooden platform on the west side of the stairwell. A single depressurization well was installed beneath the wooden platform on the west side of the stairwell. PVC ball-valves were installed on the conveyance piping to the depressurization well and to the SMD system to be used to balance airflow between the two extraction points. The conveyance piping was then routed through an exterior wall to an exterior exhaust stack on the west side of the house.

The seams around the base and edges of the wooden platform, including between the wood and the concrete foundation walls and between the wood framing members, were sealed with vapor tight caulk. Cracks between the entryway foundation walls and the basement foundation walls were sealed with caulk to minimize potential pathways for vapor leakage into the building.

The exterior exhaust stack was routed vertically up the west wall of the house and is constructed of 4-inch diameter Schedule 80 PVC piping. The stack is connected to the side of the building using Unistrut and Unistrut clamps and extends 2-feet above the side of the house. An in-line RadonAway RP140 mitigation fan was installed in the exterior exhaust stack. A condensation diverter fitting was installed immediately above the fan to protect it from corrosion. The exhaust stack was insulated with 3/4-inch closed-cell foam insulation that was wrapped with rigid aluminum jacketing for weather protection. A PVC weather cap was installed on the top of the exhaust stack to prevent precipitation accumulation in the stack. The exhaust stack was constructed with a drainage sump at the base that was fitted with a 1/4-inch diameter, quarter-turn ball valve that can be opened to drain accumulated water, if any, from the stack.

Statewide Commercial Electric was contracted to connect electrical power to both the active SSD and SMD components of the mitigation system. A dedicated 20-amp circuit was installed in the main house circuit breaker panel that supplies power to both fans. The breaker was clearly labeled ‘Vapor Fans’ in the panel. The wiring was routed around the outside perimeter of the house in rigid conduit to each blower location. A weatherproof power switch was installed adjacent to each fan.

2.2.3 Crawlspace Ventilation

The crawlspace area on the north end of the building is an above-grade addition. The south end of the addition is suspended from the house and the north end of the addition is supported by posts. Plywood skirting is present around the base of the addition to keep pests from entering. Vapors under the addition were mitigated by installing three 6-inch by 12-inch passive vents in the plywood skirting. Two vents were installed on the west side. Only one vent was installed on the east side due to space limitations imposed by the access hatch and the sloped ground surface along the east wall of the house.

2.3 736 East 3rd Avenue – North Duplex

The North Duplex is constructed on a foundation that contains a partial basement with a concrete slab and a partial dirt floor crawlspace. The basement and crawlspace are in open communication to each other. A combination of concrete vapor coating, VaporFlex® vapor barrier, active SMD, and active SSD was used to mitigate vapor intrusion of contaminants in the North Duplex. The mitigation system layout in the North Duplex is shown on Figure 5.

Ahtna assisted the residents in removing personal belongings and appliances from the basement and crawl space prior to starting work. All belongings were stored in a garage located east of the North Duplex. The vapor barrier, extraction lines, and ventilation fan from the existing SMD system, previously installed by the owner, were removed prior to commencing the installation effort.

Two previously unidentified compartments were discovered in the foundation walls along the west side of the structure. The compartments, which had been obscured by the previous vapor barrier, are situated beneath the entrances to the two residential units of the building. The compartments are shown on Figure 5. The southern compartment is constructed of concrete foundation walls with a concrete slab that is consistent with the slab in the adjacent workshop area. The northern compartment is constructed of concrete block foundation walls down to exposed soil level with the adjacent crawlspace area. Retro-Coat™ was applied to the foundation walls of both compartments and the concrete slab of the southern compartment, and VaporFlex® vapor barrier was installed over the dirt floor of the northern compartment.

An approximately 4-inch diameter plastic conduit pipe, containing multiple copper water lines, was discovered extending through the foundation wall towards the South Duplex. The building manager confirmed that the water heater, located in the basement of the North Duplex, services both buildings and that both buildings share a common cold water supply. In addition to the operational water lines, two open-ended and disconnected water lines extended between the two. No insulation or packing material was observed in the conduit to obstruct airflow between the crawlspaces of the two duplexes. Ahtna sealed the conduit and the disconnected water lines with spray foam insulation to eliminate the potential vapor migration pathway between the two buildings.

2.3.1 Concrete Slab Sealing

Multiple voids, cracks and holes were sealed in the concrete slab and foundation walls with concrete patching materials or caulking as necessary to minimize potential pathways for vapor leakage into the building. Significant sealing was performed around the above grade sewer line in the basement area where the ends penetrate the concrete slab and foundation wall.

Migration of contaminants vertically through the concrete slab and laterally through the concrete foundation walls was mitigated by sealing the surfaces with the vapor intrusion coating system, Retro-Coat™, by Land Science Technologies™. The Retro-Coat™ coating was applied along the concrete slab and concrete foundation walls of the North Duplex.

PetroChem, an installation company certified by Land Science Technologies™, prepared the surfaces and applied the Retro-Coat™. The installers prepped the surfaces by sanding and grinding the surfaces smooth. The floor was ground to a CSP-3 concrete surface profile using a grinder with a diamond wheel. The block walls were sanded by hand to remove loose mortar or concrete. Cracks in the floor were routed out with a grinding wheel to provide a groove where grout could be applied. The surfaces were thoroughly cleaned using a HEPA vacuum and wet cloths. Cracks, floor penetrations, and around utilities were sealed with an epoxy-based grout. The walls and floors were then painted with a primer coat that ensures proper adhesion of the Retro-Coat™ to the concrete. Two coats of Retro-Coat™ were applied to the floor and walls. All remaining seams and cracks were then sealed with a vapor-tight caulk that matched the color of the Retro-Coat™ product. Additional information on the Retro-Coat™ product is included in Appendix C.

2.3.2 SSD System

An SSD system was installed throughout the basement area of the house. Two 2-inch diameter depressurization wells were distributed throughout the basement using an assumed 10-foot ROI around each well. The conservative 10-foot ROI was originally planned for the system in a passive mode and will be very effective with the system in an active mode. Each depressurization well was routed through 2-inch diameter rigid Schedule 80 PVC conveyance piping. For each SSD well, a PVC ball valve and analog manometer were installed to regulate and measure the flow and vacuum levels, respectively, in each well. Each SSD well also has a sample port for testing exhaust air. The 2-inch conveyance lines were routed to a common header made of 4-inch diameter Schedule 80 PVC where they were also joined with a 20-foot section of perforated PVC SMD piping. The SMD line was fitted with a PVC ball valve for flow control. An in-line RadonAway GP501 mitigation fan was installed in common header piping prior to exiting the building.

The exterior exhaust stack was routed vertically up the northwest corner of the building and is constructed of 4-inch diameter Schedule 80 PVC piping. The stack is connected to the side of the building using Unistrut and Unistrut clamps and extends 2-feet above the side of the house. The exhaust stack was insulated with 3/4-inch closed-cell foam insulation that was wrapped with rigid aluminum jacketing for weather protection. A PVC weather cap was installed on the top of the exhaust stack to prevent precipitation accumulation in the stack. The exhaust stack was constructed with a drainage sump at the base that was fitted with a 1/4-inch diameter, quarter-turn ball valve that can be opened to drain accumulated water, if any, from the stack.

Two VMPs were installed through the concrete slab in the basement. The locations of the VMPs are shown on Figure 5. The VMPs are constructed of a 1/4-inch brass Vapor Pins with locking stainless steel covers. The top of the Vapor Pin is recessed below the top of the concrete slab to prevent damage and tripping.

2.3.3 SMD System

An SMD system was installed in the L-shaped crawlspace along the north and east sides of the building. Two sections of 4-inch diameter perforated PVC piping was installed on the floor of the crawlspace as shown on Figure 5. The perforated PVC was attached to 4-inch Schedule 80 PVC conveyance piping. One section of piping (extending east-west along the north side of the building) was routed to a shared exhaust stack with the two SSD wells near the northwest corner of the building. The north-south oriented SMD piping, along the east side of the building, was routed to a second exhaust stack located on the east side of the building. A RadonAway RP145 in-line mitigation fan was installed in the conveyance piping prior to exiting the building.

The exterior exhaust stack was routed vertically up the east wall of the building and is constructed of 4-inch diameter Schedule 80 PVC piping. The stack is connected to the side of the building using Unistrut and Unistrut clamps and extends 2-feet above the side of the house. The exhaust stack was insulated with 3/4-inch closed-cell foam insulation that was wrapped with rigid aluminum jacketing for weather protection. A PVC weather cap was installed on the top of the exhaust stack to prevent precipitation accumulation in the stack. The exhaust stack was constructed with a drainage sump at the base that was fitted with a 1/4-inch diameter, quarter-turn ball valve that can be opened to drain accumulated water, if any, from the stack.

A 10-mil thick VaporFlex® vapor barrier was installed along the floor of the crawlspace, above the perforated PVC collection piping. The vapor barrier was sealed to the Retro-Coat™ on the perimeter foundation walls using either Permalon® double-sided liner tape or Eternabond® tape in areas where Permalon® was not adhering. Any seams in the vapor barrier were overlapped by a minimum of one foot and were sealed with vapor barrier tape. The vapor barrier was sealed to all obstructions in the crawl space such as posts, furnaces, or water lines.

2.4 736 East 3rd Avenue – South Duplex

The South Duplex is constructed on a crawlspace foundation that extends under the entire structure. A passive SMD system was used to mitigate vapor intrusion of contaminants in the South Duplex. The mitigation system layout is shown on Figure 6.

The vapor barrier, extraction lines, and ventilation fan from the existing SMD system, previously installed by the owner, were removed prior to commencing the installation efforts. Two previously unidentified compartments in the foundation walls along the west side of the structure were discovered in the crawl space. The compartments, which had been obscured by the previous vapor barrier, are situated beneath the entrances to the two residential units of the building. The compartments are shown on Figure 6. The compartments are constructed of concrete foundation walls down to exposed soil level with the adjacent crawlspace area.

An SMD system was installed throughout the entire crawlspace. Two sections of 4-inch diameter perforated PVC piping were installed with a north-south orientation on the floor of the crawlspace as shown in Figure 6. The perforated PVC was attached to 4-inch Schedule 80 PVC conveyance piping that was routed through the exterior walls to two separate exterior exhaust stacks, one on the east side, and one on the west side of the building. The SMD exhaust stacks were routed vertically up the sides of the building and were constructed of 4-inch diameter, Schedule 80 PVC piping. The stacks were connected to the side of the building using Unistrut and Unistrut clamps. Wind turbine ventilation fans were affixed to the top of the stacks to promote airflow during wind events. The exhaust stack was constructed with a drainage sump at the base that was fitted with a 1/4-inch diameter, quarter-turn ball valve that can be opened to drain accumulated water, if any, from the stack.

A 10-mil thick VaporFlex® vapor barrier was installed along the floor and walls of the crawlspace, above the perforated PVC collection piping. The vapor barrier was sealed to the perimeter foundation walls using either Permalon® double-sided liner tape or Eternabond® tape in areas where Permalon® was not adhering. Additionally, plastic vapor barrier anchors were installed in the concrete wall approximately every 4-feet to support the weight of the vertical vapor barrier sections. Any seams in the vapor barrier were overlapped by a minimum of one foot and were sealed with vapor barrier tape. The vapor barrier was sealed to all obstructions in the crawl space such as posts, furnaces, or water lines.

3.0 ANALYTICAL SAMPLING AND RESULTS

Prior to and after the installation of the mitigation systems, Ahtna performed indoor air monitoring to assess the effectiveness of the systems in reducing indoor air concentrations of COCs from vapor intrusion. The indoor air monitoring consisted of collection of pre- and post-passive system installation samples for radon, and post-passive and post-active system installation samples for the site-specific COCs.

3.1 Sample Locations

The indoor air samples were collected from the basements or crawlspaces of each of the four buildings in centrally located areas with low potential for accelerated air exchange (e.g., avoiding a door or window). Figures 3 through 6 show the sample locations for each building.

3.2 Pre-Installation Air Monitoring

Pre-passive system installation samples of radon activity were collected to provide a baseline concentration for comparison with the post-passive system installation levels. This line of evidence was used instead of chemical data because there are almost no background sources of radon in the anthropogenic environment, unlike the COCs, and therefore the radon data is a more reliable line of evidence than COC data for evaluating the passive mitigation systems.

Ahtna collected radon samples in 0.5-liter Tedlar bags using a dedicated syringe for each sample in accordance with the EPA Grab Radon/Pump-Collapsible Bag method (EPA, 1996). The samples were collected between May 12 and May 22, 2014, depending on access restrictions for each building. The samples were delivered to the Department of Earth Sciences at the University of Southern California, Los Angeles, California, for analysis of radon activity by alpha scintillation counting.

Appended Table 1 presents the radon activity levels. Average pre-mitigation radon activity levels were the following:

- 1.17 picoCuries per liter (pCi/L) for 710 East 3rd Avenue
- 1.09 pCi/L for 720 East 3rd Avenue
- 1.18 pCi/L for 736 East 3rd Avenue – North Duplex
- 1.31 pCi/L for 736 East 3rd Avenue – South Duplex

3.3 Post-Installation Indoor Air Monitoring

Post-installation indoor air monitoring consisted of collection of radon samples and COC samples after the passive mitigation systems were installed in all four buildings, and collection of COC samples after the active mitigation systems were installed in two buildings.

3.3.1 Passive Mitigation Confirmation Sampling

Following installation of the passive mitigation systems, Ahtna collected both radon activity and COC samples to evaluate the effectiveness of the systems and whether remedial objectives had been met, respectively. The samples were collected on May 28, 2014.

Similar to the pre-mitigation sampling, Ahtna collected radon samples in 0.5-liter Tedlar bags using a dedicated syringe for each sample in accordance with the EPA Grab Radon/Pump-Collapsible Bag method (EPA, 1996). The samples were delivered to the Department of Earth Sciences at the University of Southern California, for analysis of radon activity by alpha scintillation counting.

For the COC samples, Ahtna used a 100%-certified clean, 6-liter stainless steel Summa canister in each building. The canisters were fitted with individual flow controllers to provide a 24-hour time-weighted average (TWA) concentration. The following actions were performed prior to sampling to ensure a representative sample was collected in each building:

- Measuring and recording the initial vacuum of the canister, and the start time, date, initial vacuum, regulator serial number and canister ID on the canister tag and the laboratory chain of custody form.
- Performing a leak detection test of the canister and flow controller.
- Retrieving the canister prior to the end of the 24-hour sampling period to ensure remaining vacuum in the canister for quality control purposes.
- Recording the final vacuum on the canister tag and chain of custody form.

A duplicate canister sample was collected from the North Duplex. ALS Environmental of Simi Valley, California, provided the canister hardware and analyzed the samples by EPA Method TO-15.

3.3.1.1 Radon Results

Appended Table 1 presents the pre- and post-passive system radon activity levels. Average radon levels changed by the following amounts and percentages per building:

- 710 East 3rd Avenue: 1.17 pCi/L to 0.53 pCi/L for a reduction of 55 percent
- 720 East 3rd Avenue: 1.09 pCi/L to 1.19 pCi/L for an increase of 9 percent
- North Duplex: 1.18 pCi/L to 0.71 pCi/L for a reduction of 40 percent
- South Duplex: 1.31 pCi/L to 0.86 pCi/L for a reduction of 34 percent

It should be noted that when the standard error of the measurements is considered for the pre- and post-radon activity levels in 720 East 3rd Avenue, as shown in Table 1, the results are statistically not significant (i.e., there is no difference in the pre- and post-passive mitigation radon levels). EPA guidance on radon mitigation states that effectiveness of passive mitigation systems ranges from zero to 90% (EPA, 1993). Therefore, the results above reflect typical performance for passive mitigation systems.

3.3.1.2 COC Results

Appended Table 2 presents the passive mitigation system confirmation samples for the COCs. All the COC concentrations were less than the the ADEC indoor air remedial goal target levels with the exception of PCE at 720 East 3rd Avenue and the North Duplex.

3.3.2 Active Mitigation Confirmation Sampling

Following retro-fit of the passive mitigation systems to active mitigation systems for 720 East 3rd Avenue and the North Duplex, Ahtna collected COC samples to evaluate whether remedial objectives had been met. The samples were collected on October 27, 2014.

Similar to the passive mitigation confirmation sampling, Ahtna used a 100%-certified clean, 6-liter stainless steel Summa canister in each building. The canisters were fitted with individual flow controllers to provide a 24-hour TWA concentration. The following actions were performed prior to sampling to ensure a representative sample was collected in each building:

- Measuring and recording the initial vacuum of the canister, and the start time, date, initial vacuum, regulator serial number and canister identification (ID) on the canister tag and the laboratory chain of custody form.
- Performing a leak detection test of the canister and flow controller.
- Retrieving the canister prior to the end of the 24-hour sampling period to ensure remaining vacuum in the canister for quality control purposes.
- Recording the final vacuum on the canister tag and chain of custody form.

A duplicate canister sample was collected from North Duplex. ALS Environmental of Simi Valley, California, provided the canister hardware and analyzed the samples by EPA Method TO-15.

Table 2 presents the active mitigation system confirmation samples for the COCs, and also provides a comparison to the passive mitigation confirmation samples. All COC concentrations were less than the ADEC indoor air remedial goal target levels for both buildings. The active mitigation systems reduced PCE concentrations by 96 and 98 percent for 720 East 3rd Avenue and the North Duplex, respectively. These percent reductions are consistent with EPA's findings that active mitigation systems may be up to 99.5 percent effective in reducing impacts from vapor intrusion (EPA, 2008).

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4.0 ANALYTICAL DATA QUALITY REVIEW

ALS provided two sample delivery groups (SDGs) for the project: P1402171 and P1404470. Appendix D contains ADEC laboratory review checklists for both SDGs. The following provides a summary of the quality assurance review of analytical data.

- All work was performed by personnel who are qualified individuals as per 18 AAC 75.990(100).
- Completeness – 100% of samples submitted were analyzed.
- Accuracy – All percent recoveries for surrogate and laboratory control samples met control limits for both SDGs.
- Precision – A field duplicate sample was collected for each SDG.
    - For SDG P1402171, relative percent difference was greater than 25% for PCE in duplicate pair 14-4G-110-IA and 14-4G-111-IA. However, qualification of the data is addressed with regard to representativeness below.
    - For SDG P1404470, relative percent differences met control limits for the duplicate pair 14-4G-121-IA and 14-4G-122-IA.
    - Relative percent differences for laboratory control duplicate samples met control limits for both SDGs.
- Comparability – Samples were analyzed by the same laboratory and the same analytical method.
- Representativeness – Air samples were collected from proposed locations at proposed rates and duration. Canisters were leak-checked prior to sampling. The duplicate sample 14-4G-111-IA in SDG P1402171 had no vacuum at the time of retrieval. The results for sample 14-4G-111-IA have been flagged as estimated "J" because of the lack of representativeness given that it is unknown how long the canister filled and canister integrity could not be verified at the laboratory post-shipping.
- Sensitivity – Laboratory reporting limits were less than ADEC indoor air target levels for COCs. Trip blanks, equipment blanks, and decontamination blanks were not necessary for this project. Method blank results were non-detect and less than the target levels for both SDGs.

Based on the review, all sample results are considered usable with no data rejected. "J" data qualifiers were assigned to sample 14-4G-111-IA for the PCE and trans-1,2-DCE results due to a lack of vacuum at the time of canister retrieval.

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5.0 WASTE MANAGEMENT

The investigation-derived waste (IDW) generated during the effort included soil cuttings from the installation of the depressurization wells, material from the removal of the former SMD system at the duplexes at 736 East 3rd Avenue, spent materials and equipment associated with the application of the Retro-Coat™ and various personal protective equipment materials utilized during the remedial effort. In accordance with the approved design plan, the soil removed during the installation of the SSD wells was placed with the soil in the crawlspaces of the same building. No soil was removed from any of the buildings or transferred between buildings. No IDW was generated during the analytical sampling events at the buildings.

The remaining IDW, including disposable sample gloves, paper towels, dust masks, rollers, scrap building and piping materials, empty Retro-Coat™ containers, scrap liner material, and various other waste generated during the effort was bagged and placed in a solid waste receptacle for disposal at the Anchorage Municipal Landfill.

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6.0 ACTIVE SYSTEM STARTUP AND BALANCING

The two mitigation fans installed at the North Duplex and the SSD fan installed at 720 East 3rd Avenue were initially started up on October 3, 2014. The SMD system in 720 East 3rd Avenue was started up on October 7, 2014. An initial round of operational system parameters were collected immediately following system startup. The ball valves on the individual flow lines were adjusted to generally balance the flow between the extraction points for each building. System parameters were collected again after one week, and then finally after approximately three weeks of system operation to ensure stable operation. The system parameters were recorded on Vapor Mitigation System Data Sheets. Completed data sheets are included in Appendix A.

Sub-slab vacuum readings were collected from VMPs installed in the concrete slabs where active mitigation systems were installed. Sub-slab vacuum readings from the monitoring events on October 7, 2014 and October 27, 2014 are listed in Table 6-1 below. The readings from the October 3, 2014 monitoring event were not included due to erroneous readings from a faulty field manometer.

TABLE 6-1: SUB-SLAB VACUUM READINGS

Address	Location ID	Sub-Slab Vacuum Reading (10/7/2014)	Sub-Slab Vacuum Reading (10/27/2014)
720 East 3rd Avenue	VMP-1	0.28	0.277
736 East 3rd (North Duplex)	VMP-1	0.17	0.175
	VMP-2	0.12	0.117

Note: All readings in inches of water column (inWC)

Based on the ADEC Vapor Intrusion Guidance, an induced sub-slab vacuum of at least 0.02 inches of water column (inWC) is recommended for active sub-slab depressurization. The vacuum readings in both buildings were 5 to 10 times greater than the 0.02 inWC threshold and contained little variation over a 20-day operating period.

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7.0 MONITORING, MAINTENANCE AND REPAIR PLAN

Ahtna has developed individual MM&R Plans for the mitigation systems in each of the four structures. The MM&R plans are provided in Appendix E. Each individual plan includes the following items:

- A brief description of the system installed in each structure.
- A schematic figure of the components and layout of each building's mitigation system.
- Maintenance and monitoring activities to be performed by the property owner.
- Maintenance and monitoring activities to be performed by an environmental professional.

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8.0 CONCLUSIONS AND RECOMMENDATIONS

The primary objective of this project was to design and install vapor intrusion mitigation systems that reduce contaminant vapors in the buildings to concentrations less than the respective ADEC target levels for residential indoor air. The secondary objectives for the project were to install cost effective systems that were easy for property owners to operate and maintain and provide long-term sustained operation until the chlorinated solvent source area at this site is remediated.

Vapor mitigation systems were installed at four buildings. Passive mitigation systems were installed at 710 East 3rd Avenue and 736 East 3rd Avenue – South Duplex. Post passive-system installation indoor air sampling confirmed that COC concentrations have been reduced below the ADEC residential indoor air target levels in both buildings.

The initial passive mitigation systems that were installed at 720 East 3rd Avenue and 736 East 3rd Avenue – North Duplex did not decrease the indoor air concentrations to less than the ADEC residential target levels so active mitigation systems were installed. Post active-system installation indoor air sampling confirmed that COC concentrations have been reduced below the ADEC residential indoor air target levels in both buildings.

Continued operation of the vapor mitigation systems is recommended until contaminant sources have been remediated. Routine monitoring and maintenance of the systems is recommended based on the schedule and methods outlined in the MM&R Plans.

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9.0 REFERENCES

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TABLES

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Table 1
Radon Activity Results
4th and Gambell Vapor Intrusion Mitigation

Location	Sample Type	Sample ID	Sample Date	Radon (pCi/L)	±1 Standard Deviation (pCi/L)	Lower Bound (pCi/L)	Upper Bound (pCi/L)
710 E 3rd	Pre-Installation	14-4G-103-IA	5/15/2014	1.17	0.14	1.02	1.31
	Post-Installation	14-4G-107-IA	5/28/2014	0.53	0.06	0.46	0.59
720 E 3rd	Pre-Installation	14-4G-104-IA	5/22/2014	1.09	0.05	1.04	1.15
	Post-Installation	14-4G-105-IA	5/28/2014	1.19	0.08	1.11	1.27
736 E 3rd North Duplex	Pre-Installation	14-4G-101-IA	5/12/2014	1.18	0.09	1.09	1.27
	Post-Installation	14-4G-109-IA	5/28/2014	0.71	0.08	0.63	0.78
736 E 3rd South Duplex	Pre-Installation	14-4G-102-IA	5/12/2014	1.31	0.09	1.22	1.41
	Post-Installation	14-4G-112-IA	5/28/2014	0.86	0.07	0.78	0.93

Key:

pCi/L = picoCuries per liter

Table 2
VOC Analytical Results
4th and Gambell Vapor Intrusion Mitigation

Location	Sample Type	Sample ID	Sample Date	PCE ($\mu g/m^3$)	TCE (µg/m3)	cDCE (µg/m3)	tDCE (µg/m3)	1,1-DCE (µg/m3)	VC (µg/m3)
710 E 3rd	Passive System Confirmation	14-4G-108-IA	5/28/2014	3.9	ND (0.16)	ND (0.16)	ND (0.16)	ND (0.16)	ND (0.16)
720 E 3rd	Passive System Confirmation	14-4G-106-IA	5/28/2014	**66**	ND (0.15)	ND (0.15)	0.19	ND (0.15)	ND (0.15)
	Active System Confirmation	14-4G-123-IA	10/27/2014	2.6	0.65	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)
736 E 3rd North Duplex	Passive System Confirmation	14-4G-110-IA	5/28/2014	**78**	ND (0.16)	ND (0.16)	0.84	ND (0.16)	ND (0.16)
	Passive System Confirmation	14-4G-111-IA	duplicate	**53 J**	ND (0.12)	ND (0.12)	0.82 J	ND (0.12)	ND (0.12)
	Active System Confirmation	14-4G-121-IA	10/27/2014	1.6	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)
	Active System Confirmation	14-4G-122-IA	duplicate	1.7	ND (0.15)	ND (0.15)	ND (0.15)	ND (0.15)	ND (0.15)
736 E 3rd South Duplex	Passive System Confirmation	14-4G-113-IA	5/28/2014	8.8	ND (0.17)	ND (0.17)	ND (0.17)	ND (0.17)	ND (0.17)
ADEC Indoor Air Target Levels				**42**	**2.0**	**7.3**	**63**	**210**	**1.6**

Notes: Value in parentheses is the laboratory reporting limit.
Bolded values exceed ADEC Indoor Air Target Level.
ADEC Indoor Air Target Levels from Appendix D of ADEC's *Vapor Intrusion Guidance for Contaminated Sites, October 2012* .

Key:
ADEC = Alaska Department of Environmental Conservation
cDCE = cis-1,2-dichloroethene
DCE = dichloroethene
J = estimated result
$\mu g/m^3$ = micrograms per cubic meter
ND = not detected
PCE = tetrachloroethene
TCE = trichloroethene
VC = vinyl chloride
VOC = volatile organic compound

FIGURES

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SOURCE: NATIONAL GEOGRAPHIC TOPO SOFTWARE PROGRAM 2010..

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DATE: NOV. 2014
REV.: –
CHKD: N.P.O.
DRAWN: C.E.H.
PROJ. No.: 15-001

Ahtna Engineering

SITE LOCATION MAP

VAPOR INTRUSION MITIGATION INSTALLATION REPORT
EPA EMERGENCY AND RAPID RESPONSE SERVICES
4TH AND GAMBELL SITE
Anchorage, Alaska

FIGURE 1

PATH: D:\Project Drawings\2014 Drawings\14 Gambell\14 GAM VIM RPT FILE: 14-GAM-VIM-RPT-F1.DWG PLOTTED: 11/26/14.

PATH (b)(4) copyright

SOURCE: AERIAL PHOTO PROVIDED BY GOOGLE EARTH DATED 4/2011.

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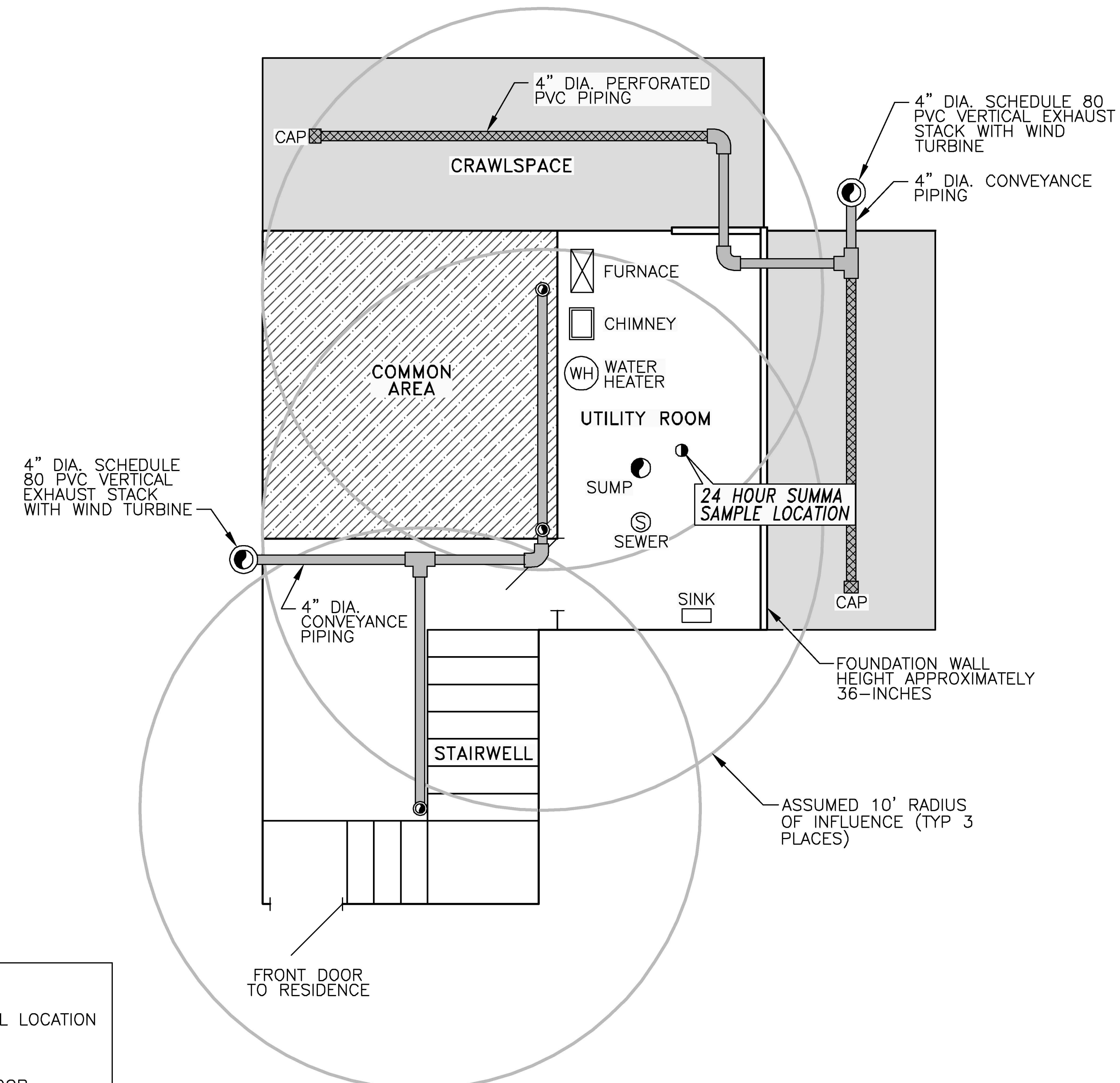
APPROX. SCALE IN FEET

DATE: NOV. 2014 REV.: – CHKD: N.P.O. DRAWN: C.E.H. PROJ. No.: 15–001	Ahtna Engineering	**SITE PLAN** VAPOR INTRUSION MITIGATION INSTALLATION REPORT EPA EMERGENCY AND RAPID RESPONSE SERVICES 4TH AND GAMBELL SITE Anchorage, Alaska	FIGURE 2



LEGEND

- INDOOR AIR SAMPLE LOCATION
- 2" DIAMETER EXTRACTION WELL LOCATION
- VAPOR BARRIER ON SOIL
- AREA WITH WOOD FRAMED FLOOR OVER SOIL
- PERFORATED PVC PIPE
- CONVEYANCE PIPE

NOTE:
VAPOR BARRIER EXTENDS TO TOP OF FOUNDATION WALLS AROUND BUILDING PERIMETER.

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FIGURE 3

710 E. 3rd AVENUE - AS-BUILT

VAPOR INTRUSION MITIGATION INSTALLATION REPORT
EPA EMERGENCY AND RAPID RESPONSE SERVICES
4TH AND GAMBELL SITE
Anchorage, Alaska

Ahtna Engineering

DATE: DEC. 2014
REV.: –
CHKD: N.P.O.
DRAWN: C.E.H.
PROJ. No.: 15-001

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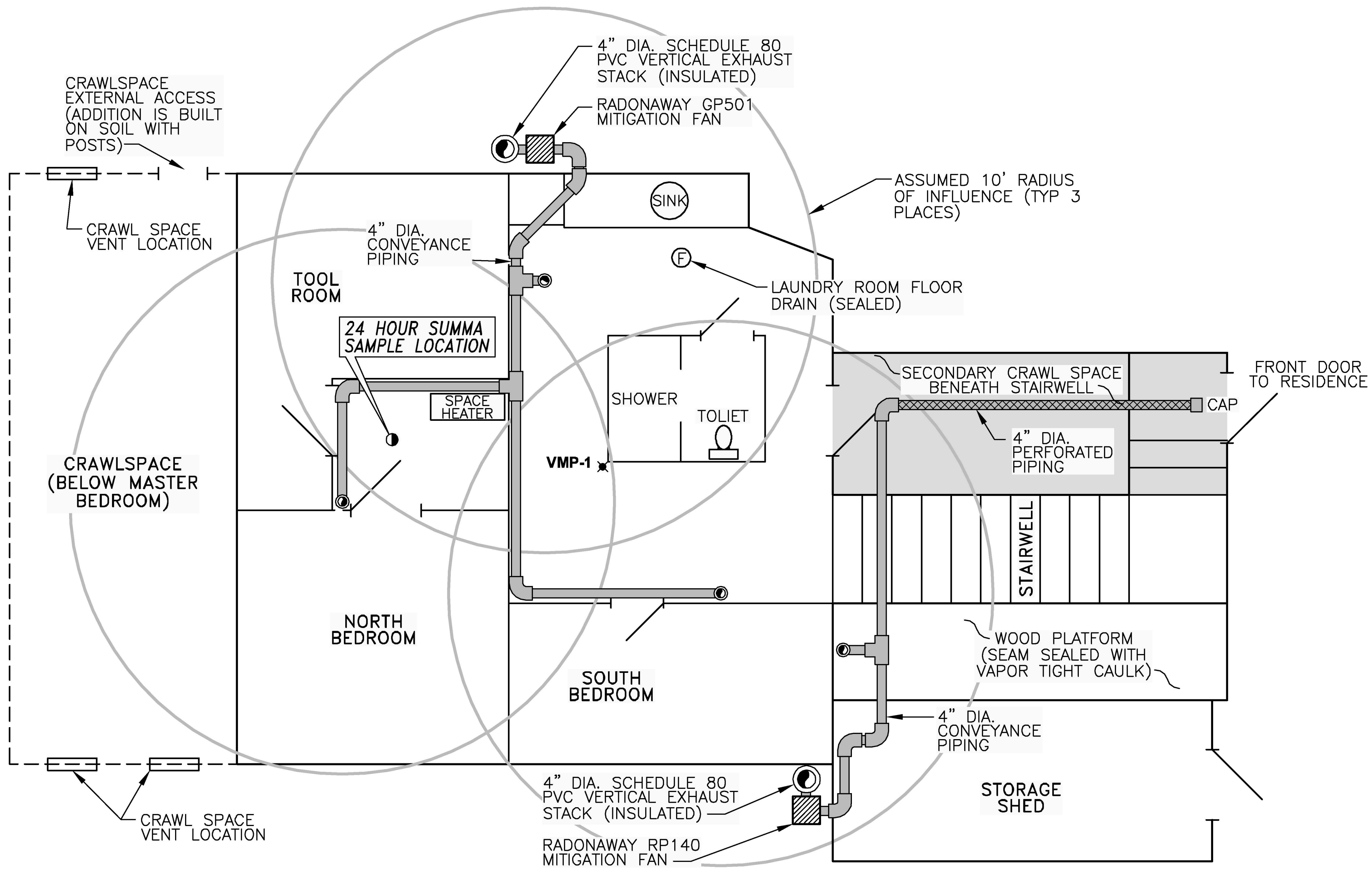

LEGEND

VMP-1	VAPOR MONITORING POINT LOCATION
	INDOOR AIR SAMPLE LOCATION
	2" DIAMETER EXTRACTION WELL LOCATION
	VAPOR BARRIER ON SOIL
	PERFORATED PVC PIPE
	CONVEYANCE PIPE

NOTE:
VAPOR BARRIER EXTENDS TO TOP OF FOUNDATION WALLS AROUND BUILDING PERIMETER.

0 2.5 5
APPROX. SCALE IN FEET

PATH: D:\Project Drawings\2014 Drawings\14 Gambell\14 GAM VIM RPT FILE: 14-GAM-VIM-RPT-F4.DWG PLOTTED: 12/4/14.

FIGURE 4

720 E. 3rd AVENUE - AS-BUILT

VAPOR INTRUSION MITIGATION INSTALLATION REPORT
EPA EMERGENCY AND RAPID RESPONSE SERVICES
4TH AND GAMBELL SITE
Anchorage, Alaska

Ahtna Engineering

DATE: DEC. 2014
REV.: -
CHKD: N.P.O.
DRAWN: C.E.H.
PROJ. No.: 15-001

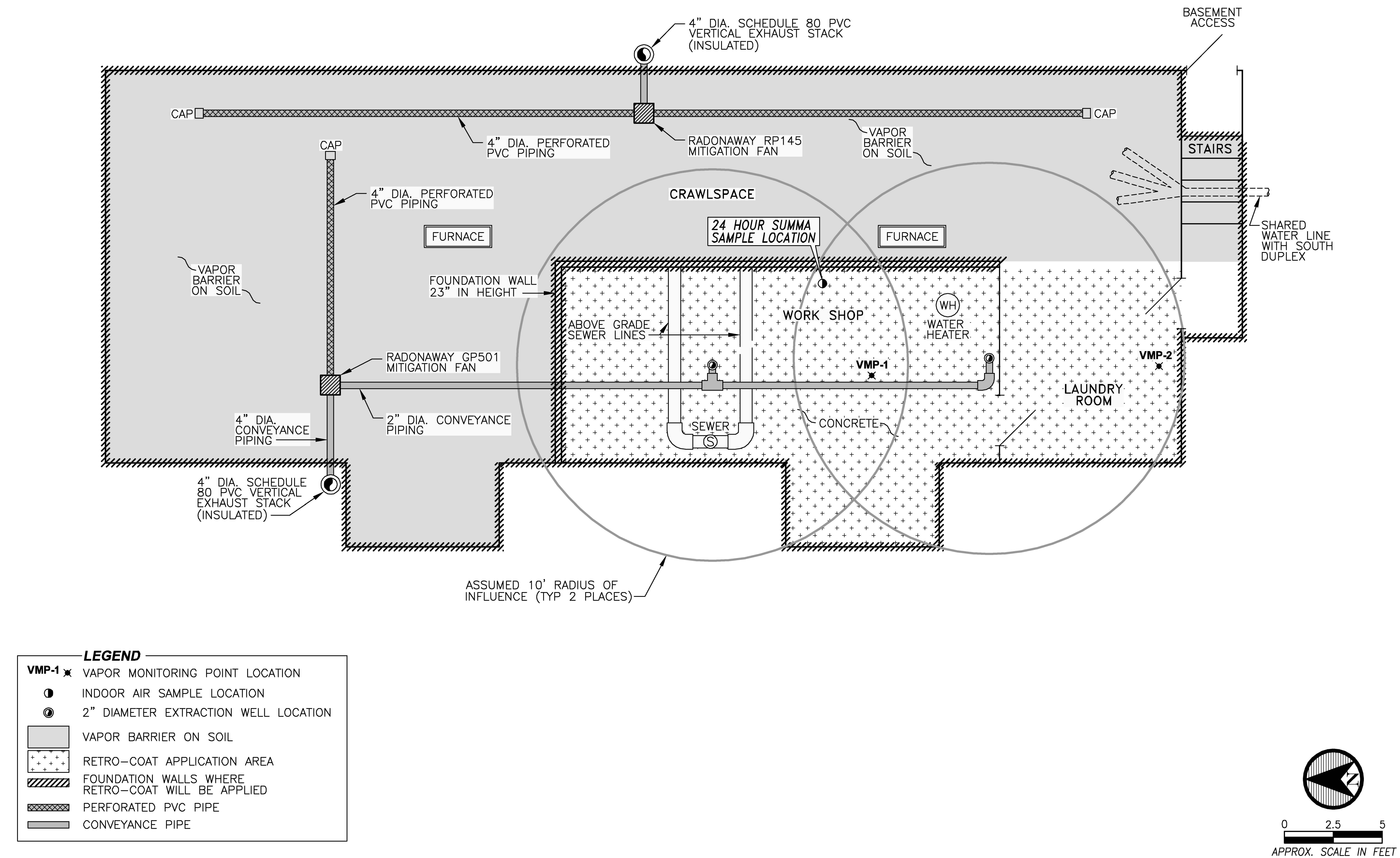

FIGURE 5

736 E. 3rd AVENUE (NORTH DUPLEX) AS-BUILT

VAPOR INTRUSION MITIGATION INSTALLATION REPORT
EPA EMERGENCY AND RAPID RESPONSE SERVICES
4TH AND GAMBELL SITE
Anchorage, Alaska

Ahtna Engineering

DATE: DEC. 2014
REV.: –
CHKD: N.P.O.
DRAWN: C.E.H.
PROJ. No.: 15-001

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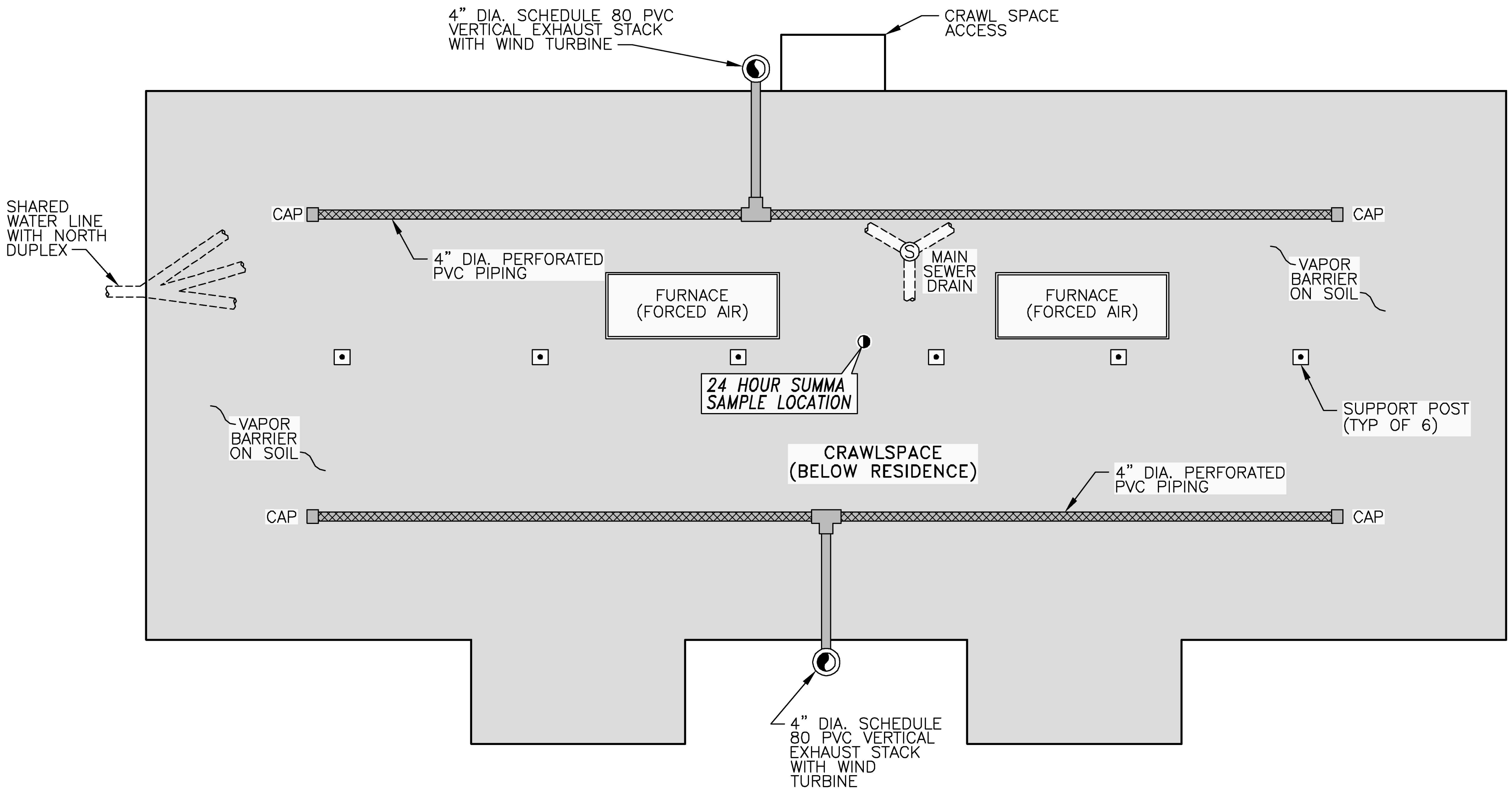
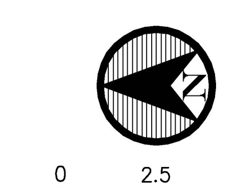


LEGEND

- INDOOR AIR SAMPLE LOCATION
- VAPOR BARRIER ON SOIL
- RETRO–COAT APPLICATION AREA
- FOUNDATION WALLS WHERE RETRO–COAT WILL BE APPLIED
- PERFORATED PVC PIPE
- CONVEYANCE PIPE

NOTE:
VAPOR BARRIER EXTENDS TO TOP OF FOUNDATION WALLS AROUND BUILDING PERIMETER.



APPROX. SCALE IN FEET

FIGURE 6

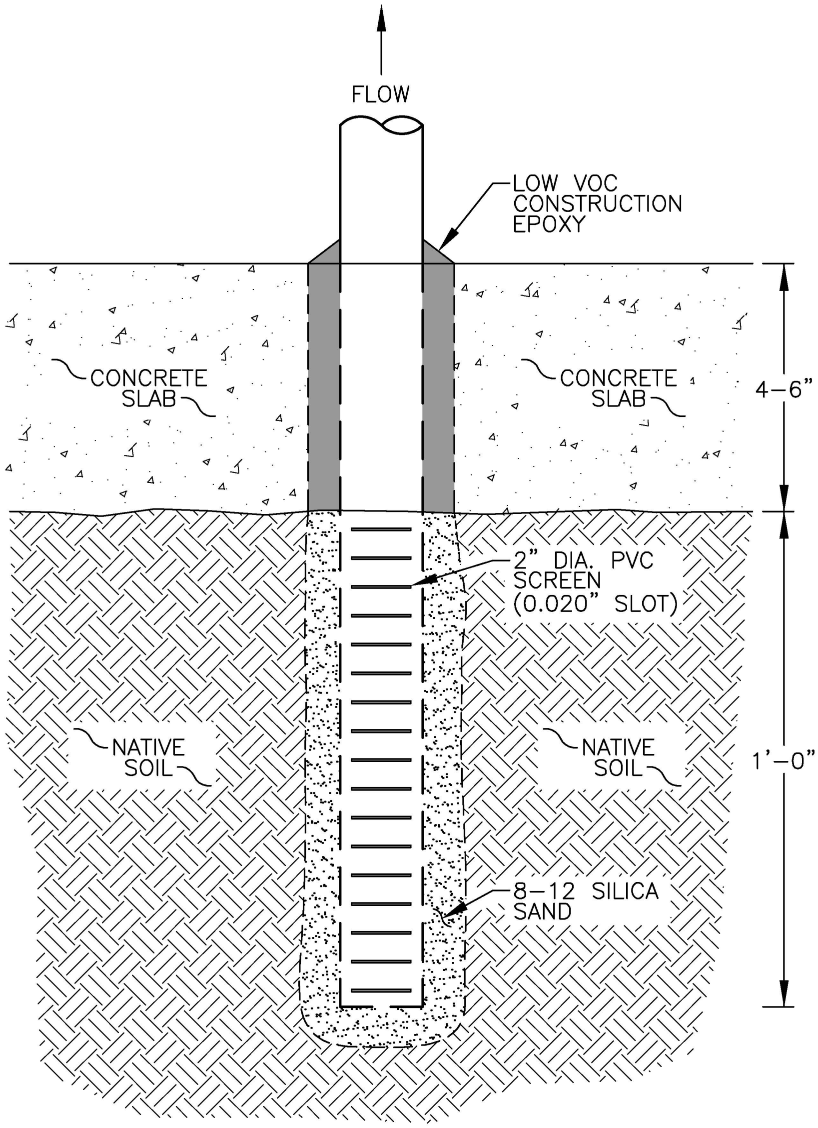
736 E. 3rd AVENUE (SOUTH DUPLEX) AS-BUILT

VAPOR INTRUSION MITIGATION INSTALLATION REPORT
EPA EMERGENCY AND RAPID RESPONSE SERVICES
4TH AND GAMBELL SITE
Anchorage, Alaska

Ahtna Engineering

DATE: DEC. 2014
REV.: –
CHKD: N.P.O.
DRAWN: C.E.H.
PROJ. No.: 15–001

PATH: D:\Project Drawings\2014 Drawings\14 Gambell\14 GAM VIM RPT FILE: 14–GAM–VIM–RPT–F6.DWG PLOTTED: 12/4/14.



WELL DETAIL
NOT TO SCALE

DATE: NOV. 2014 REV.: – CHKD: N.P.O. DRAWN: C.E.H. PROJ. No.: 15–001	Ahtna Engineering	**SUB-SLAB DEPRESSURIZATION WELL DETAIL** VAPOR INTRUSION MITIGATION INSTALLATION REPORT EPA EMERGENCY AND RAPID RESPONSE SERVICES 4TH AND GAMBELL SITE Anchorage, Alaska	**FIGURE** **7**

PATH: D:\Project Drawings\2014 Drawings\14 Gambell\14 GAM VIM RPT FILE: 14–GAM–VIM–RPT–F7.DWG PLOTTED: 11/27/14.

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APPENDIX A

FIELD NOTES AND DATA SHEETS

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4TH + GAMBELL E. KIRK/N. OBERLEE?

MONDAY MAY 12, 2014 60°F/CLEAR

0900 - HITCH TRAILER / DEPART SHOP

1030 - COMPLETE PICKUP OF PIPING @ FERGUSON

1100 - ARRIVE ONSITE. MEET WITH BRYAN CHERNICK

∴ UNLOAD PIPING

1200 - BEN MARTICH / GEOSYNTEC + JOSH MILLER / AES ARRIVE

1205 - RADON SAMPLING @ 736 E 3RD NORTH DUPLEX

SAMPLE ID: 14-4+G-101-IA

1 LITER BAG (TEDLAR)

FILL BAG W/ 780 ML

1210 - SAMPLING @ 736 E 3RD SOUTH DUPLEX

SAMPLE ID: 14-4+G-102-IA

1 LITER TEDLAR BAG

FILL BAG W/ 780 ML

1230 - BEGIN PREPPING NORTH DUPLEX FOR RETRO COAT INSTALL:

- STRIP VAPOR BARRIER FROM WALLS
- PATCH HOLES IN FLOOR

BUMP OUTS ON WEST WALL WERE PRESENT BEHIND VAPOR BARRIER. THEY ARE THE FOUNDATION UNDER TWO ENTRYWAYS ON HOUSE. HOLES IN BLOCKS WERE BROKEN OUT IN 4 PLACES. SEALED HOLES WITH FOAM BOARD + SPRAY FOAM. WILL FILL WITH GEL FROM REGENESIS.

Scale: 1 square =

MONDAY MAY 12, 2014 65° /CLEAR

1530 - 4" ABS PIPE IS PRESENT UNDER STAIRWELL. APPEARS TO BE CONVEYANCE PIPE FOR COPPER WATER LINES THAT RUN TO SOUTH DUPLEX. SEALED WITH SPRAY FOAM.

1630 - FINISH FOR DAY. CLEAN UP SITE.
- DRIVE TO POLAR SUPPLY TO PICK UP VAPOR BARRIER.

1800 - FINISH FOR DAY.

Scale: 1 square = ______

TUESDAY - MAY 13, 2014 55°F /CLEAR

0800 - ARRIVE ONSITE
- MEET WITH BRYAN CHERNICK + PETROCHEM INSTALLERS.
- WALK NORTH DUPLEX W/ PETROCHEM. THEY RECOMMEND SANDING/BRUSHING/WET CLOTHES VS. PRESSURE WASHING TO AVOID MUD IN CRAWL SPACE.

0900 - MEET WITH EARL LIVERMAN FROM EPA
- BEGIN WORK IN SOUTH DUPLEX

1100 - WALK THROUGH 710 + 720 E. 3RD WITH EPA + EQ.

1130 - LUNCH

1200 - CONTINUE INSTALLATION IN SOUTH DUPLEX.
- PETROCHEM NOTED THAT WATER IS COMING UNDER WEST BLOCK WALL IN NORTH DUPLEX.
- WE WILL PUT HEATERS ON IT TONIGHT TO DRY.

1500 - MEET WITH BOB WHITTIER, WALLY (EPA) EARL TO DISCUSS SCOPE

1530 - ADEC ARRIVES ONSITE TO SEE WORK.

1630 - TRACE OUT WIRE TO NORTH DUPLEX VI BLOWER WITH GLEN DEAN.

1730 - CLEAN UP / LEAVE SITE

Scale: 1 square = ______

4TH + GAMBELL Z.K/N.O/J.M

WEDNESDAY MAY 15, 2014 70°/CLEAR

0800 - ARRIVE ONSITE / TAILGATE MEETING WITH EPA + EQ.

- PETROCHEM ARRIVES. WATER STILL PRESENT UNDER WEST WALL OF NORTH DUPLEX. WILL TRY DRYING WITH HEAT GUN.

1130 - COMPLETE INSTALLATION OF BOTH EXHAUST STACKS ON SOUTH DUPLEX

- COMPLETE VB INSTALL ON NORTH WALL OF SOUTH DUPLEX CRAWL SPACE.

Scale: 1 square =

4TH + GAMBELL Z.K/N.O/J.M

THURSDAY MAY 15, 2014 60°F /CLEAR

0800 - ARRIVE ONSITE

- TAILGATE SAFETY MEETING

0830 - CONTINUE WORK IN SOUTH DUPLEX

- PICK UP WELL SUPPLIES AND TAPE FROM AK MINERALS + POLAR SUPPLY.

0845 - CALL (b) (6) [redacted] FOR ACCESS.

- SHE WAS UPSET REGARDING A CONVERSATION WITH ADEC YESTERDAY.

- REPORT CONVERSATION to EQ + EPA

0930 - MEET WITH EPA. CARL OVERPECK TALKED TO (b) (6) [redacted] to SMOOTH THINGS OVER. ACCESS to 710 E. 3RD GRANTED FOR THIS AFTERNOON.

1030 - WALK SITE WITH SANDY FROM EPA.

1230 - COLLECT RADON SAMPLE FROM 710 E. 3RD CRAWL SPACE.

SAMPLE ID: 14-46-103-IA

- BEN MARTICH WILL SHIP SAMPLE to LAB TODAY.

- CONTINUE WORK IN SOUTH DUPLEX

1800 - COMPLETE VAPOR BARRIER INSTALL IN SOUTH DUPLEX

- OFFSITE

Scale: 1 square =

Rite in the Rain

4TH + GAMBELL

FRIDAY MAY 16, 2014

0800 - MEET ONSITE / TAILGATE SAFETY MTG.

0830 - BEGIN WORK IN 710 E. 3RD.

- SPEND 1.5 HOURS (ZACK AND NATE)
  JOSH 0.5 HOURS

  MOVING BELONGINGS FROM CRAWL SPACE.

- CRAWL SPACE HAS WOOD ON FLOOR.

1000 - ZK AND JM BEGIN RUNNING PERFORATED PIPE. NO INSTALLS OUTSIDE HOLE FOR EXHAUST STACK. MOVE STACK to NORTH WALL BECAUSE TENT IS BLOCKING EAST WALL OF HOUSE.

- ZK + JM CONTINUE INSTALLING VAPOR BARRIER IN EAST CRAWL SPACE.
- NO BEGINS INSTALLING EXTRACTION WELLS IN NORTH END OF COMMON AREA. NO SLAB IS PRESENT UNDER CARPET/PLYWOOD AREA. PLYWOOD SUBFLOOR IS APPROX 8-10 INCHES ABOVE DIRT WITH NO VAPOR BARRIER.

1030 - REMOVE SOIL FROM 2 EXTRACTION WELL LOCATIONS USING SHOP VAC DOWN to 14" BELOW PLYWOOD.

WELL SCREEN IS 0.020" SLOT, BACKFILL AROUND WELL WITH 8-12 SILICA SAND.

4TH + GAMBELL ZK/JM/NO.

FRIDAY MAY 16, 2014 70°F / CLEAR

1130 - PETROCHEM PRIMES WALLS OF NORTH DUPLEX. LOW TEMPS IN BASEMENT ARE CAUSING A ~~LONGER~~ CURING TIME. PLACED SPACE HEATERS TO RAISE TEMP. PETROCHEM OFFSITE. THEY WILL RETURN AROUND 6:00 pm TO APPLY 1ST COAT OF PETROCOAT.

1215 - CONTINUE INSTALL IN 710 E. 3RD. RUN CONVEYANCE PIPING FROM 2 WELLS.

1500 - COMPLETE EAST CRAWL SPACE VB INSTALL. BEGIN INSTALLING IN NORTH CRAWL SPACE.

- INSTALL 4" LINE THROUGH WEST WALL OF HOUSE FOR EXTRACTION WELL EXHAUST STACK.

1800 - STOP FOR DAY. CLEAN UP SITE.

1830 - OFFSITE.

4TH + GAMBELL N.O.

SATURDAY MAY 17, 2014 70°F/CLEAR

1130 - ARRIVE ONSITE to MEET WITH PETROCHEM.
- THEY completed SECOND COAT OF EPOXY PAINT AND ARE ALMOST FINISHED WITH CAULKING.
- THEY WILL BE OFFSITE ONCE CAULKING IS COMPLETE.

Scale: 1 square =

4TH + GAMBELL ZK/N.O./Z.R.

MONDAY - MAY 19, 2014 65°F/CLEAR

0800 - MEET ONSITE / TAILGATE SAFETY MTG.

0815 - CONTINUE WORK IN 710 E. 3RD.
- HOMEOWNER CLEANED 75% OF ITEMS OUT OF BASEMENT OVER WEEKEND.

0900 - CARL OVERPECK STOPS BY to check on PROGRESS.
- INSTALL LAST EXTRACTION WELL THROUGH CONCRETE SLAB.
- COMPLETE PIPING TO EXHAUST STACK.

1230 - CONTINUE INSTALLING VAPOR BARRIER IN NORTH CRAWL SPACE.

1500 - CONSTRUCT PLYWOOD PLATFORMS, RAISED ON 2X10 LUMBER TO PROTECT VAPOR BARRIER WHEN ITEMS ARE STORED IN CRAWL SPACE.
- BEGIN INSTALLING CRAWL SPACE PIPING IN NORTH DUPLEX.

1700 - RUN FIRST SHEET OF VAPOR BARRIER IN NORTH DUPLEX.

Scale: 1 square =

4TH + GAMBELL Z.K./N.O./Z.R

TUESDAY - MAY 20, 2014 65°F/CLEAR

0800 - MEET ONSITE/TAILGATE SAFETY MTG

1030 - Complete Platforms in 710 E. 3RD.
- VACUUM Carpets/CLEAN SITE.
- CONTINUE Laying Vapor BARRIER in North Duplex.

1100 - ~~Route~~ INSTALL DEPRESSURIZATION WELLS IN NORTH DUPLEX.
- Route CONVEYANCE PIPING TO WELLS.
- SEAL AROUND WELL RISER WITH SIMPSON CONCRETE EPOXY.
- SEAL SOUTH WELL IN 710 E. 3RD WITH SAME EPOXY.
- SEAL TWO NORTH WELLS IN 710 W/ SILICONE CAULK.

1730 - STOP FOR DAY.
VAPOR BARRIER IN NORTH DUPLEX NEEDS 2-3 HOURS WORK TOMORROW.
- (b) (6) [redacted] SAYS WE CANNOT ACCESS HER HOUSE UNTIL THURSDAY.

Scale: 1 square =

4TH + GAMBELL Z.K./N.O./Z.R

WEDNESDAY - MAY 21, 2014 65°F/CLEAR

0800 - MEET ONSITE
- TAILGATE SAFETY MEETING

0830 - CONTINUE INSTALLING VAPOR BARRIER IN NORTH DUPLEX.

0930 - SEAL AROUND BASE OF STAIRWELL AND BEHIND STAIRS USING FOAM BOARD AND SPRAY FOAM.

1130 - LOAD ZACH'S TRUCK WITH ALL TRASH FOR DUMP RUN.
- LUNCH.

1215 - CONTINUE INSTALLING VAPOR BARRIER

1400 - COMPLETE VAPOR BARRIER IN NORTH DUPLEX.

1630 - Complete INSTALLATION OF EXHAUST STACKS ON NORTH DUPLEX.
- INSTALL EXHAUST STACK ON WEST SIDE OF 710 E. 3RD.

1800 - OFFSITE

Scale: 1 square =

4TH + GAMBELL N.O./Z.K

THURSDAY MAY 22, 2014 50°F / SMOKE

0800 - TAILGATE SAFETY MTG.

0810 - MEET WITH VICKI MILLER

· SHOW HER WHERE EXTRACTION WELLS WILL BE LOCATED.

0830 - BEN MARTICH + SAM FOX FROM GEOSYNTECH TO COLLECT RADON SAMPLE

SAMPLE ID: 14-46-104-IA

TIME: 0840

0850 - BEGIN INSTALLING EXTRACTION WELLS IN 720 E. 3RD.

- REALIZE FROM CONVERSATIONS WITH MRS. MILLER THAT DIRT FLOOR CRAWL SPACE IS PRESENT UNDER STAIRWELL.

· BRYAN CHERNICK CONFIRMS WITH EPA FOR US TO INCLUDE PIPING / EXHAUST STACK / VAPOR BARRIER.

1100 - ORDER ADDITIONAL PIPE + FITTINGS FROM FERGUSON.

1230 - CONTINUE RUNNING PIPING TO 720 E. 3RD. EXTRACTION WELLS.

1630 - ~~INSTALL OUTSIDE EXHAUST STACK ON WEST SIDE OF 710 E. 3RD.~~

- CAULK WEST SIDE OF 720 STAIRWELL TO SEAL.

1800 - OFFSITE

Scale: 1 square =

4TH + GAMBELL N.O./Z.K./Z.R.

FRIDAY MAY 23, 2014 60°F / SMOKE

0800 - MEET ONSITE / TAILGATE SAFETY MTG.

· (b) (6) [redacted] CLEANED OUT CRAWL SPACE UNDER STAIRS.

0830 - BEGIN INSTALLING VAPOR BARRIER

· DRILL PILOT HOLE ON EAST WALL FOR EXHAUST STACK. NOT ENOUGH CLEARANCE FOR 4" PIPE.

- GET PERMISSION FROM MRS. MILLER TO ROUTE EXHAUST THROUGH WEST WALL / THROUGH STORAGE SHED / THEN OUT.

1000 - COMPLETE CONVEYANCE PIPING IN 720 E. 3RD to EXTRACTION WELLS.

1230 - INSTALL WIND TURBINES ON STACKS AT NORTH + SOUTH DUPLEXES.

1400 - INSTALL EAST EXHAUST STACK ON 720 E. 3RD.

1630 - INSTALL NORTH STACK ON 710 E. 3RD.

1730 - INSTALL WEST STACK ON 720 E. 3RD.

· COMPLETE INSTALLATION OF SMD SYSTEM AND VAPOR BARRIER UNDER STAIRS IN 720 E. 3RD.

1900 - CLEAN SITE / REMOVE TRASH + SUPPLIES

1915 - OFFSITE

Scale: 1 square =

4TH + GAMBELL N.O.

SATURDAY MAY 24, 2014 65°F / CLEAR

1200 - PICK UP 20' SECTIONS OF PIPE (EXTRAS) WITH TRAILER.

Scale: 1 square =

4TH + GAMBELL N.O.

TUESDAY MAY 27, 2014 55°F / OVERCAST

1400 - PURCHASE CRAWL SPACE VENTS AND CAULK

1430 - ARRIVE ONSITE

- INSTALL 3 CRAWL SPACE VENTS ON 720 E. 3RD.
- CAULK AROUND ALL EXTERIOR PENETRATIONS (EXHAUST STACKS, UNISTRUT)

1530 - REPAIR CARPET AROUND 710 E. 3RD EXTRACTION WELLS.

- STORE EXTRA VAPOR BARRIER + TAPE IN SOUTH DUPLEX CRAWL SPACE
- MOVE SAMPLE TUBING FOR HAPSITE TO ORIGINAL LOCATION IN SOUTH DUPLEX CRAWL SPACE.

1600 - REMOVE EXTRA SUPPLIES FROM AROUND DUPLEXES.

- STORE EXTRA GRAY RETROCOAT AT AHTNA WAREHOUSE.

Scale: 1 square =

5/28/2014 4th + Gosbell Overcast 55°F

1000 Geosyntec Sam Fox (SF) + Ben Martich (BM) at 720 E 4th. Will collect ~~to~~ @ post-mitigation radon + TO-15 samples. Rescon Nate Oberlee is providing escort during sampling.

1005 SF collects post-mitigation radon sample 14-46-105-IA in basement of 720 E 4th. 780 ml of indoor air placed into new 1-liter Tedlar using dedicated syringe.

1010 Deploy 6-liter can sample 14-46-106-IA in basement in threshold of NW room. Sample has 24-hour regulator. Canister ID 4991.

1020 SF collects post-mitigation radon sample 14-46-107-IA. Collected in basement of 710 E 4th. Using dedicated 1-liter Tedlar and dedicated syringe filled 780 ml in bag.

1025 Deploy 6-liter can sample 14-46-108-IA in basement in eastern room. 24-hour sample. Canister ID is 4192.

Ben Martich
5/28/14

1035 SF collects post-mitigation radon sample 14-46-109-IA in ~~to~~ @ crawl space of North Duplex. 780 ml collected in 1-liter Tedlar (dedicated) and dedicated syringe.

1045 Collect crawl space TO-15 sample in crawl space. Plus duplicate. 6-liter cans. 24-hour regulators. Primary sample is 14-46-110-IA Can ID 11953. Dupe sample is 14-46-111-IA Can ID 5018

1100 SF collects post-mitigation radon sample in crawl space of south Duplex. 780 ml collected in dedicated Tedlar (1-l) with dedicated syringe (60-cc).

~~1105~~ @ Radon sample ID 14-46-112-IA.

1105 Deploy 6-liter can (ID 10838) in crawl space of South Duplex. ~~24-flo~~ 24-hour flow. 14-46-113-IA.

1120 Depart site

Ben Martich
5/28/14

Scale: 1 square = Scale: 1 square = Rite in the Rain

5/29/14 4th + Gambell Overcast 52°F

0945 Retrieve sample 108-IA from 710 E 3rd. Initial vac was 30 in Hg. Final vac. is 7 in Hg.

0950 Ben Motich + Sam Fox retrieve sample 106-IA from 720 E 3rd Ave. Initial vac was 30 inHg. Final vac is 7 inHg.

Note: Flow controller for 106-IA has ID of F215424. Flow controller for 108-IA has ID of F220436.

1000 Retrieve samples 110-IA + dupe 111-IA from North Duplex.
~~Final~~ Initial vac on 110 was 30 inHg and final vac was 7 inHg.
Initial vac on 111 was 30 inHg and final vac was 0 inHg.
Flow controller ID for 110 is FCA00823
Flow controller ID for 111 is F221880

1015 Retrieve sample 113-IA in South Duplex. Initial vac was 30 inHg. Final vac is 8 in Hg. Flow controller has ID of FCA00093

1020 Depart site.

5/29/14

Scale: 1 square = ____

4TH + GAMBELL N.O.

JUNE 13, 2014 OVERCAST, 45°F

0930 - PICK UP PPB PID FROM TTT

0945 - ARRIVE ONSITE
- START UP PID OUTSIDE. FRESH AIR CAL
- BEGIN SCREENING NORTH DUPLEX BASEMENT.

BASEMENT BACKGROUND: 1.19 PPB

1030 - LEAVE SITE

N.O.

Scale: 1 square = ____

Rite in the Rain

4TH + GAMBELL Z.K./N.O.

WEDNESDAY OCT 1, 2014 40°F, CLEAR

0800 - MEET ONSITE WITH BRYAN CHERNICK

- MEET WITH [redacted] - LANDLORD @ NORTH DUPLEX. GET KEY TO NORTH DUPLEX.
- WATER + SEWAGE LEAKS ARE PRESENT IN MULTIPLE LOCATIONS ON TOP OF THE VAPOR BARRIER. STANDING WATER/SEWAGE IS PRESENT ON THE BASEMENT FLOOR (RETROCOAT)

0900 - PICK UP MOP AND CLEANING SUPPLIES FROM AIH.

0930 - BEGIN CLEANING BASEMENT SO WORK CAN COMMENCE.

1100 - COMPLETE CLEANING BASEMENT.

- BEGIN INSTALLING BLOWERS AND VALVES.
  - INSTALL 2" BALL VALVE, SAMPLE PORT + MANOMETER ON EACH EXTRACTION LINE.
  - INSTALL GP501 + RP145 FANS ON EXHAUST LINES
  - INSTALL 4" BALL VALVE ON SYSTEM 1 SMD LINE.

1230 - CLEAN UP BASEMENT, BREAK FOR LUNCH.

1315 - INSULATE OUTSIDE EXHAUST STACKS.

- REMOVE WIND TURBINES.

1845 - COMPLETE INSULATION ON STACKS. LEAVE SITE.

4TH + GAMBELL N.O./RB.

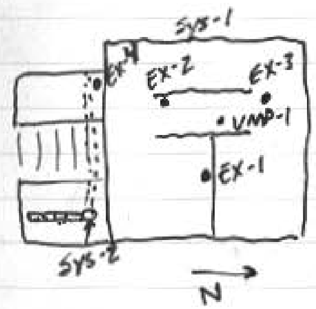
FRIDAY OCT. 3, 2014 35°F, CLEAR

0830 - ARRIVE ONSITE / TAILGATE SAFETY MTG

- CONTINUE INSULATING STACKS IN 720 E. 3RD.
- ELECTRICIANS CONNECTING BLOWERS IN N. DUPLEX.

1145 - START UP SYSTEM IN 720 E. 3RD

- LABEL EXTRACTION WELLS



WELL ID.	(FPM) VELOCITY ~~FLOW~~	VACUUM	(% OPEN) VALVE	WELL DIA.
EX-1	2075	2.6" WC	OPEN 100%	2-IN
EX-2	420	2.4" WC	OPEN 100%	2-IN
EX-3	1190	2.3" WC	OPEN 100%	2-IN
EX-1	1360	1.5" WC	50%	
EX-2	504	2.8" WC	100%	
EX-3	1434	2.6" WC	100%	

Scale: 1 square = Scale: 1 square =

4TH AND GAMBELL N.O./R.B.

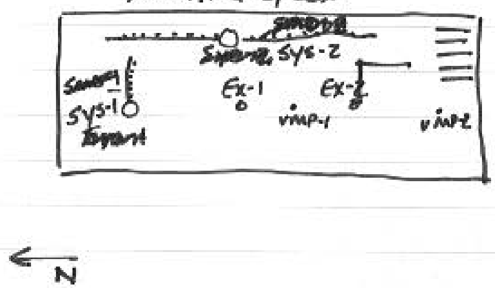
FRIDAY OCT. 3RD, 2014 45°F, OVERCAST

1320 - START UP SYSTEMS IN NORTH DUPLEX

- LABEL EXTRACTION WELLS

~~NORTH WELL~~

NORTH DUPLEX



WELL ID	(IN WC) VACUUM	VELOCITY FLOW (FPM)	VALVE OPEN (%)	WELL DIA.
EX-1	1.1	280	100%	2-IN
EX-2	1.2	460	100%	2-IN
SYS-1	NA	1175	50%	4-IN
SYS-2	0.4	2115	NA	4-IN

VAPOR MONITORING POINTS

VMP-1 2.016

VMP-2 2.011

Scale: 1 square =

4TH AND GAMBELL N.O./Z.K./J.D.

THURSDAY OCT 2, 2014 35°F, CLEAR

0800 - MEET ONSITE / TAILGATE SAFETY MTG.

- INSTALL TWO VAPOR MONITORING POINTS IN NORTH DUPLEX SLAB.

0900 - MEET WITH VICKI AND CALVIN MILLER.

- BEGIN INSTALLING VALVES AND SAMPLE PORTS IN 720 E. 3RD.
- INSTALL VAPOR MONITORING POINT IN CENTER OF HOUSE IN MAIN HALLWAY.

0930 - STATEWIDE COMMERCIAL ELECTRIC BEGINS INSTALLING DEDICATED CIRCUIT FOR FANS.

- A 20-AMP BREAKER IS INSTALLED IN SPARE BAY IN MAIN PANEL. LABELED BREAKER "VM-FANS"

1200 - BEGIN INSULATING EXHAUST STACKS.

- INSTALL FANS OUTSIDE BUILDING.
- INSTALL CONDENSATE BYPASS ABOVE FANS.

1800 - COMPLETE INSULATION OF EAST STACK.

- LOCK HOUSES. LEAVE SITE.

Scale: 1 square =

4TH AND GAMBELL N.O./R.B.

FRIDAY OCT. 3, 2014

0800 - MEET ONSITE

- CONTINUE INSTALLATION OF PIPE INSULATION ON EXTERIOR STACKS.
- STATEWIDE COMPLETING ELECTRICAL CONNECTION TO 720 E. 3RD.

1100 - START UP SYSTEMS. COMPLETE UM DATA SHEET.

1400 - CLEAN UP SITE.

N.O.

4th + Gambell N.O/BM.

~~Fu~~ Monday Oct 27, 2014

1400 Nate Oberlee + Ben Martich meet to put out air samples and check on system diagnostics.

1410 Place sample 14-46-121-IA in the basement of North Duplex. Duplicate sample 14-46-122-IA also. Duplicate ~~paired~~ pair are T'd together with Teflon tubing and 3-way fitting. Primary sample 121-IA is collected in 100%-certified 6-liter can with ID 17137. 24-hour flow controller has ID 804894. Initial vac ~~of~~ is 28 in Hg.

Duplicate sample has time listed as 1420. 100%-certified, 6-liter can with ID 16992. 24-hour flow controller has ID F214086. Initial vac is 30 in Hg.

1435 Deploy sample 14-46-123-IA in the basement of 720 E 3rd. Sample collected in 6-liter 100%-certified can with ID 16808. 24-hour flow controller has ID 005341. Initial vac is 26 in Hg.

1500 Depart site

B. Martich

10/27/14

4th + Cantrell N.O.|B.M.

Tuesday, Oct 28

1400 Nate Oberlee + Ben Martich meet
to retrieve samples.

1405 Retrieve duplicate pair in North Duplex.
Sample 121-IA has final vacuum
of 9 in Hg. Sample 122-IA has
final vacuum of 6 in Hg

1420 Retrieve air sample from 720 E 3rd.
Final vacuum is 3 in Hg.

1430 Depart site.

BMartich
10/28/14

Scale: 1 square =

VAPOR MITIGATON SYSTEM DATA SHEET

Project Number:	**15-001**	**Client:**	**USEPA**
Project Name:	**4TH and Gambell - Vapor Mitigation**	**Sampler:**	**Nate Oberlee**
Weather:	**35 deg F / Clear**	**Date / Time:**	**October 3, 2014 / 1145**

720 East 3rd Avenue

Location ID	Vacuum - INITIAL (inWC)	Vacuum - FINAL (inWC)	Velocity - INITIAL (Ft / min)	Velocity - FINAL (Ft / min)	Flow - INITIAL (CFM)	Flow - FINAL (CFM)	Valve Position - INITIAL (% Open)	Valve Position - FINAL (% Open)	Comments
System - 1 (Basement Extraction Wells)									
EX - 1	2.6	1.5	2075	1360	42.5	27.8	100	50	
EX - 2	2.4	2.8	420	504	8.6	10.3	100	100	
EX - 3	2.3	2.6	1190	1434	24.3	29.3	100	100	
System - 2 (Stairwell SMD System and Extraction Well)									
EX-4									Not installed yet
SYS-2									
Vapor Monitoring Points									
VMP-1	*2.016*		NA	NA	NA	NA	NA	NA	

Comments / Observations:

736 East 3rd Avenue - North Duplex

Location ID	Vacuum - INITIAL (inWC)	Vacuum - FINAL (inWC)	Velocity - INITIAL (Ft / min)	Velocity - FINAL (Ft / min)	Flow - INITIAL (CFM)	Flow - FINAL (CFM)	Valve Position - INITIAL (% Open)	Valve Position - FINAL (% Open)	Comments
System - 1 (SMD and Extraction Wells)									
EX - 1	1.1	NA	280	NA	5.7	NA	100	NA	
EX - 2	1.2	NA	460	NA	9.4	NA	100	NA	
SYS-1 (4" DIA)	NA	NA	1175	NA	93.3	NA	50	NA	
System - 2 (SMD System)									
SYS-2	0.4	NA	2115	NA	168.0		NA	NA	
Vapor Monitoring Points									
VMP-1 (North)	*2.016*	NA	NA	NA	NA	NA	NA	NA	
VMP-2 (South)	*2.011*	NA	NA	NA	NA	NA	NA	NA	

Comments / Observations: NOTE: Manometer was not zeroing correctly during readings.

VAPOR MITIGATON SYSTEM DATA SHEET

Project Number:	15-001	**Client:**	USEPA
Project Name:	4TH and Gambell - Vapor Mitigation	**Sampler:**	Nate Oberlee / Zack Kirk
Weather:	32 deg F / Clear	**Date / Time:**	October 7, 2014 / 1140

720 East 3rd Avenue

Location ID	Pipe Diameter	Vacuum - INITIAL (inWC)	Vacuum - FINAL (inWC)	Velocity - INITIAL (Ft / min)	Velocity - FINAL (Ft / min)	Flow - INITIAL (CFM)	Flow - FINAL (CFM)	Valve Position - INITIAL (% Open)	Valve Position - FINAL (% Open)	Comments
System - 1 (Basement Extraction Wells)										
EX - 1	2 - inch	1.5	NA	1400	NA	28.6	NA	50	NA	
EX - 2	2 - inch	2.9	NA	642	NA	13.1	NA	100	NA	
EX - 3	2 - inch	2.75	NA	1385	NA	28.3	NA	100	NA	
System - 2 (Stairwell SMD System and Extraction Well)										
EX-4	2 - inch	NA	NA	978	NA	20.0	NA	100	NA	
SYS-2	4 - inch	0.2	NA	607	NA	48.2	NA	50	NA	
Vapor Monitoring Points										
VMP-1	NA	0.28	NA							

Comments / Observations: System parameters were same as October 3, 2014 readings, so no adjustments were made.

736 East 3rd Avenue - North Duplex

Location ID	Pipe Diameter	Vacuum - INITIAL (inWC)	Vacuum - FINAL (inWC)	Velocity - INITIAL (Ft / min)	Velocity - FINAL (Ft / min)	Flow - INITIAL (CFM)	Flow - FINAL (CFM)	Valve Position - INITIAL (% Open)	Valve Position - FINAL (% Open)	Comments
System - 1 (SMD and Extraction Wells)										
EX - 1	2 - inch	1.20	NA	475	NA	9.7	NA	100	NA	
EX - 2	2 - inch	1.25	NA	685	NA	14.0	NA	100	NA	
SYS-1	4 - inch	NA	NA	1190	NA	94.5	NA	50	NA	
System - 2 (SMD System)										
SYS-2	4 - inch	0.40	NA	2140	NA	170.0	NA			
Vapor Monitoring Points										
VMP-1 (North)	NA	0.17	NA							
VMP-2 (South)	NA	0.12	NA							

Comments / Observations:

VAPOR MITIGATON SYSTEM DATA SHEET

Project Number:	15-001	**Client:**	USEPA
Project Name:	4TH and Gambell - Vapor Mitigation	**Sampler:**	Nate Oberlee /Ben Martich
Weather:	25 deg F / Clear	**Date / Time:**	October 27, 2014 / 1400

720 East 3rd Avenue

Location ID	Pipe Diameter	Vacuum - INITIAL (inWC)	Vacuum - FINAL (inWC)	Velocity - INITIAL (Ft / min)	Velocity - FINAL (Ft / min)	Flow - INITIAL (CFM)	Flow - FINAL (CFM)	Valve Position - INITIAL (% Open)	Valve Position - FINAL (% Open)	Comments
System - 1 (Basement Extraction Wells)										
EX - 1	**2 - inch**	1.5	NA	1233	NA	25.2	NA	50	NA	
EX - 2	**2 - inch**	2.9	NA	638	NA	13.1	NA	100	NA	
EX - 3	**2 - inch**	2.75	NA	1547	NA	31.7	NA	100	NA	
System - 2 (Stairwell SMD System and Extraction Well)										
EX-4	**2 - inch**	NA	NA	1079	NA	22.1	NA	100	NA	
SYS-2	**4 - inch**	0.2	NA	395	NA	31.4	NA	30	NA	
Vapor Monitoring Points										
VMP-1	**NA**	0.277	NA							

Comments / Observations: System parameters were same as October 3, 2014 readings, so no adjustments were made.

736 East 3rd Avenue - North Duplex

Location ID	Pipe Diameter	Vacuum - INITIAL (inWC)	Vacuum - FINAL (inWC)	Velocity - INITIAL (Ft / min)	Velocity - FINAL (Ft / min)	Flow - INITIAL (CFM)	Flow - FINAL (CFM)	Valve Position - INITIAL (% Open)	Valve Position - FINAL (% Open)	Comments
System - 1 (SMD and Extraction Wells)										
EX - 1	**2 - inch**	1.20	NA	385	NA	7.9	NA	100	NA	
EX - 2	**2 - inch**	1.2	NA	585	NA	12.0	NA	100	NA	
SYS-1	**4 - inch**	NA	NA	1156	NA	91.8	NA	50	NA	
System - 2 (SMD System)										
SYS-2	**4 - inch**	0.50	NA	NM	NA	NM	NA			
Vapor Monitoring Points										
VMP-1 (North)	**NA**	0.175	NA							
VMP-2 (South)	**NA**	0.117	NA							

Comments / Observations:

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APPENDIX B

PHOTOGRAPH LOG

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Photograph 1: Collection of baseline indoor air samples.

Photograph 2: Patched cracks in foundation in advance of applying vapor barrier paint.

Photograph 3: Water lines extending through buried conduit piping between the North and South Duplexes at 736 East 3rd Avenue.

Photograph 4: Cleaning and removing old vapor barrier material in the North Duplex.

Photograph 5: Connecting sections of perforated piping for the sub-membrane depressurization system.

Photograph 6: Installing vapor barrier material around vertical posts in the crawlspace of the South Duplex.

Photograph 7: Installing sub-membrane depressurization system in the South Duplex.

Photograph 8: Sub-membrane depressurization piping in North Duplex.

Photograph 9: Vapor barrier installed along concrete foundation wall in the South Duplex.

Photograph 10: Vapor barrier installed over the sub-membrane depressurization system in the crawlspace of the South Duplex.

Photograph 11: Crawlspace area in the 710 East 3rd Avenue structure.

Photograph 12: Vapor barrier in the crawlspace of the 710 East 3rd Avenue building.

Photograph 13: Wooden platforms installed over the vapor barrier and perforated piping to provide storage space while protecting the liner.

Photograph 14: Sub-membrane depressurization piping for the two crawlspace areas in the 710 East 3rd Avenue building.

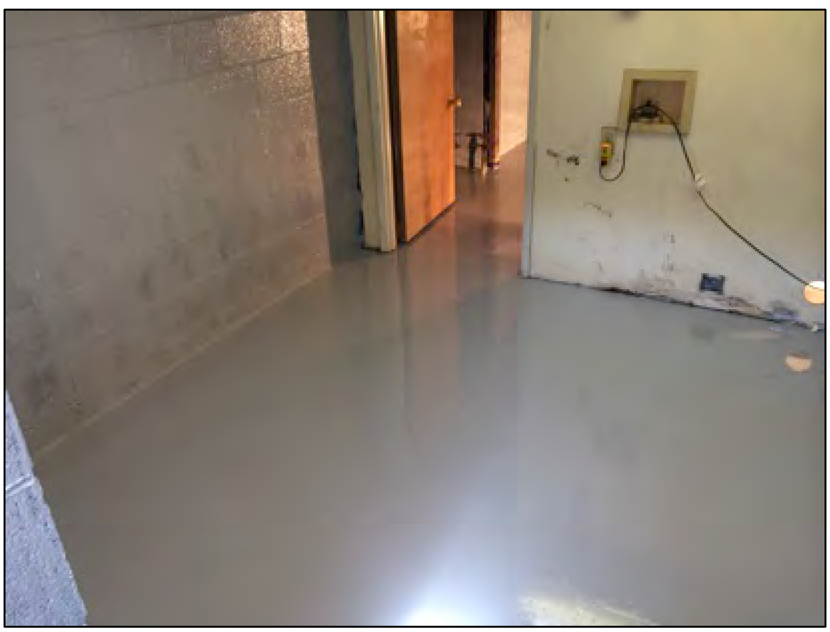
Photograph 15: Crawlspace area beneath the entryway of the 720 East 3rd Avenue structure.

Photograph 16: Vapor barrier installed over sub-membrane depressurization line in the crawlspace area at 720 East 3rd Avenue.

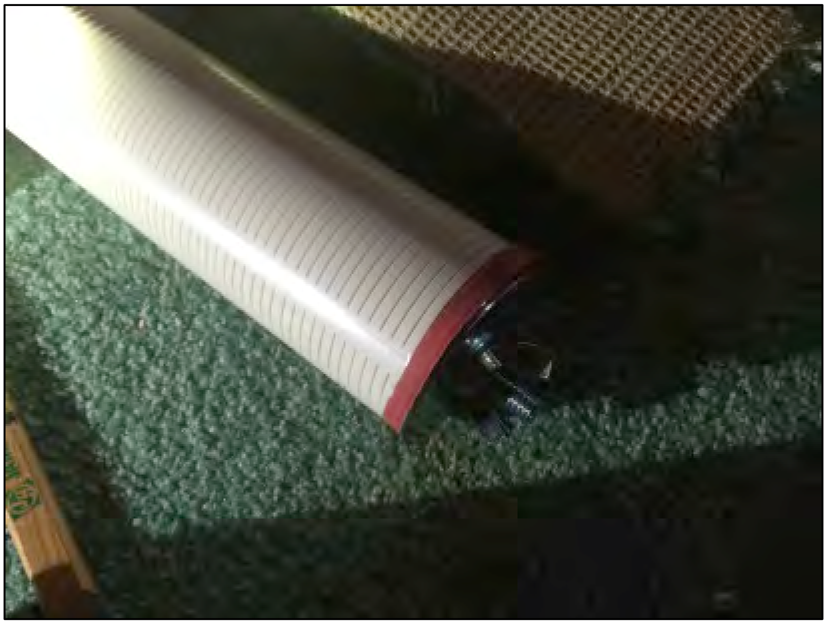
Photograph 17: Drilling borehole for installation of sub-slab depressurization well in the North Duplex building.

Photograph 18: Installing the well screen for the sub-slab depressurization well in the North Duplex building.

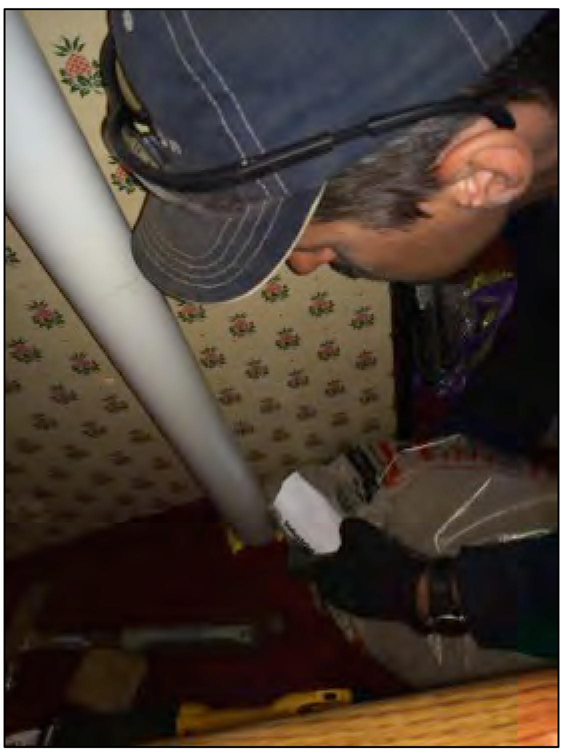
Photograph 19: Applying Retro-Coat™ vapor barrier primer on the concrete walls of the North Duplex.



Photograph 20: Completed application of Retro-Coat™ on the concrete floor and walls in the North Duplex.

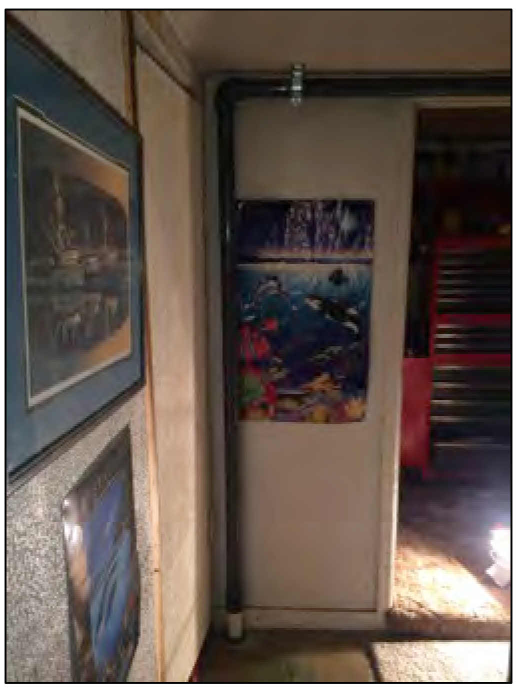


Photograph 21: Close-up image of well screen for sub-slab depressurization wells.

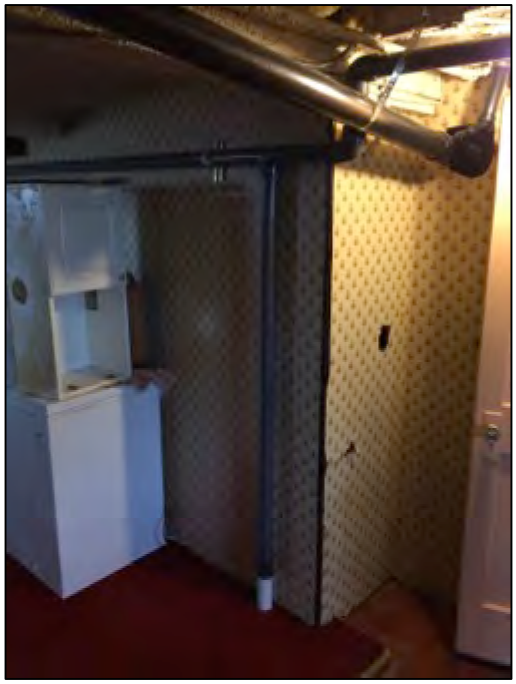


Photograph 22: Installing sand pack around well screen of a sub-slab depressurization well in the 720 East 3rd Avenue building.

Photograph 23: Completed installation of passive mitigation system components in the North Duplex.



Photograph 24: Completed sub-slab depressurization well and conveyance piping in the 720 East 3rd Avenue building.



Photograph 25: Completed sub-slab depressurization well and conveyance piping in the 710 East 3rd Avenue building.

Photograph 26: Completed passive exhaust stack with wind powered ventilation fan.

Photograph 27: Image of the condensate drain valve at the base of the exhaust stacks.

Photograph 28: Flow control valve and analog manometer installed on a sub-slab depressurization well in the 720 East 3rd Avenue building.

Photograph 29: Flow control valve and analog manometer installed on a sub-slab depressurization well in the North Duplex building.

Photograph 30: Sub-slab vapor monitoring point in the concrete floor of the North Duplex building.

Photograph 31: Installing depressurization well beneath wooden platform in the 720 East 3rd Avenue building.

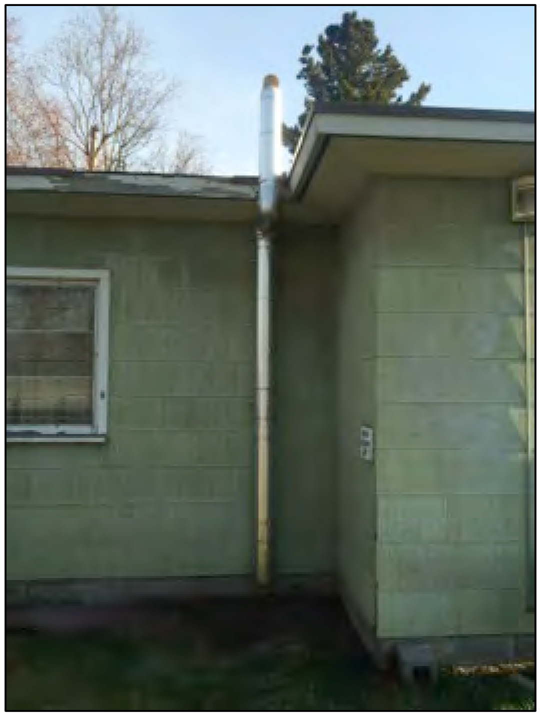
Photograph 32: Analog manometer installed on the vertical pipe from the sub-membrane depressurization line in the crawlspace of the 720 East 3rd Avenue building.

Photograph 33: Completed installation of the inline fan servicing the sub-membrane and sub-slab depressurization lines on the west side of the North Duplex.

Photograph 34: Completed installation of the inline exhaust fan on the vertical riser pipe of the sub-membrane depressurization line of the west side o the North Duplex.

Photograph 35: Exterior installation of an inline exhaust fan on the western exhaust stack at the 720 East 3rd Avenue building.

Photograph 36: Installing aluminum flashing around the exhaust stack insulation on the North Duplex building.



Photograph 37: Completed installation of the stack insulation and the weatherproof flashing on the west side of the North Duplex building.

Photograph 38: Completed installation of the inline fan, stack insulation and the weatherproof flashing on the west side of the 720 East 3rd Avenue building.

Photograph 39: Completed installation of the inline fan, stack insulation and the weatherproof flashing on the east side of the 720 East 3rd Avenue building.

Photograph 40: Post-installation indoor air sampling in the North Duplex building.

APPENDIX C

SYSTEM COMPONENT CUT SHEETS

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The data, statements and recommendations set forth in this product information sheet are based on testing, research and other development work which has been carefully conducted by Land Science Technologies, and we believe such data, statements and recommendations will serve as reliable guidelines. However, this product is subject to numerable uses under varying conditions over which we have no control, and accordingly, we do NOT warrant that this product is suitable for any particular use. Users are advised to test the product in advance to make certain it is suitable for their particular production conditions and particular use or uses.

WARRANTY – All products manufactured by us are warranted to be first class material and free from defects in material and workmanship.

Liability under this warranty is limited to the net purchase price of any such products proven defective or, at our option, to the repair or replacement of said products upon their return to us transportation prepaid. All claims hereunder on defective products must be made in writing within 30 days after the receipt of such products in your plant and prior to further processing or combining with other materials and products. WE MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE SUITABILITY OF ANY OF OUR PRODUCTS FOR ANY PARTICULAR USE, AND WE SHALL NOT BE SUBJECT TO LIABILITY FROM ANY DAMAGES RESULTING FROM THEIR USE IN OPERATIONS NOT UNDER OUR DIRECT CONTROL.

THIS WARRANTY IS EXCLUSIVE OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND NO REPRESENTATIVE OF OURS OR ANY OTHER PERSON IS AUTHORIZED TO ASSUME FOR US ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF OUR PRODUCTS.

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RadonAway™

The world's leading radon fan manufacturer

GP Series

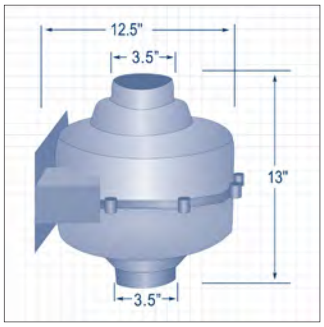
Radon Mitigation Fan

All RadonAway™ fans are specifically designed for radon mitigation. GP Series Fans offer a wide range of performance options that make them ideal for most sub-slab radon mitigation systems.

Features

- Quiet operation
- Water-hardened motor
- Seams sealed under negative pressure (to inhibit radon leakage)
- Mounts on duct pipe or with integral flange
- 3″ diameter ducts for use with 3″ or 4″ pipe
- Electrical box for hard wire or plug in
- ETL Listed - for indoor or outdoor use
- 4 interchangeable GP models

MODEL	P/N	FAN DUCT DIAMETER	WATTS	MAX. PRESSURE"WC	TYPICAL CFM vs. STATIC PRESSURE WC						
					1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP201	23007-1	3"	40-60	2.0	82	58	5	-	-	-	-
GP301	23006-1	3"	55-90	2.6	92	77	45	10	-	-	-
GP401	23009-1	3"	60-110	3.4	93	82	60	40	15	-	-
GP501	23005-1	3"	70-140	4.2	95	87	80	70	57	30	10



Made in USA with US and imported parts

ETL Listed

All RadonAway inline radon fans are covered by our 5-year, hassle-free warranty

For Further Information Contact

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RadonAway

The world's leading radon fan manufacturer

RP Series

Radon Mitigation Fan

All RadonAway™ fans are specifically designed for radon mitigation. RP Series Fans provide superb performance, run ultra-quiet and are attractive. They are ideal for most sub-slab radon mitigation systems.

Features

- Energy efficient
- Ultra-quiet operation
- Meets all electrical code requirements
- Water-hardened motorized impeller
- Seams sealed to inhibit radon leakage (RP140 & RP145 double snap sealed)
- RP140 and RP260 Energy Star® Rated
- ETL Listed - for indoor or outdoor use
- Thermally protected motor
- Rated for commercial and residential use

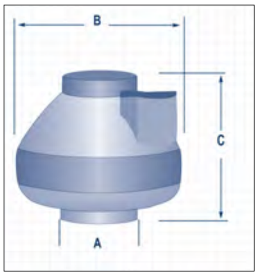
MODEL	P/N	FAN DUCT DIAMETER	WATTS	MAX. PRESSURE"WC	TYPICAL CFM vs. STATIC PRESSURE WC				
					0"	.5"	1.0"	1.5"	2.0"
RP140*	23029-1	4"	15-21	0.8	135	70	-	-	-
RP145	23030-1	4"	41-72	2.1	166	126	82	41	3
RP260*	23032-1	6"	50-75	1.6	272	176	89	13	-
RP265	23033-1	6"	91-129	2.3	334	247	176	116	52
RP380*	28208	8"	95-152	2.3	497	353	220	130	38

*Energy Star® Rated

Made in USA with US and imported parts

ETL Listed

All RadonAway inline radon fans are covered by our 5-year, hassle-free warranty



Model	A	B	C
RP140	4.5"	9.7"	8.5"
RP145	4.5"	9.7"	8.5"
RP260	6"	11.75"	8.6"
RP265	6"	11.75"	8.6"
RP380	8"	13.41"	10.53"

For Further Information Contact

9/12
P/N 02008

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LAYFIELD
Product Cut Sheet

VaporFLEX

1. Product Description

The VaporFLEX® product line has been designed to perform as a highly effective vapor barrier that impedes the infiltration of moisture and water vapor through concrete slabs and foundations. VaporFLEX® is used to discourage mold growth and to prevent harmful vapors from migrating through the concrete into building interiors. It exceeds all of the standards for a CLASS A vapor barrier as set out by ASTM E1745 requirements. The Class A is ASTM's highest performance standard for "Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs." VaporFLEX® vapor barriers are available in both a 15 mil and a 10 mil thick variation, each exceeding the physical requirements of ASTM E1745. They are available in easy-to-use rolls, 12' x 150' and 15' x 196' respectively, making them easy to transport and install. VaporFLEX® is readily available through any of our Western U.S. locations, Canadian locations, or various National Distributor accounts.

2. Technical Data

Materials information is on page 2.

3. Installation

Where appropriate, install VaporFLEX® vapor barriers in accordance with ASTM E 1643-98 (Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs).The granular base needs to be compacted and graded in accordance with the projects plans & specifications. The base should be free of all protruding objects and debris. VaporFLEX® should be unrolled parallel to the direction that the concrete will be poured. After unrolling, pull out the folds to the full roll width. The vapor barrier should be left deployed in a relaxed state. Overlap all seams a minimum of 6" and continuously seal the overlap with 4" VaporFLEX® Tape. Contact Layfield for detailed instructions on how to seal around penetrations.

4. Availability and Cost

Available from Layfield or distributors. Call
425-254-1075 Pacific time
780-453-6731 Mountain time, or
905-761-9123 Eastern time

5. Inspected By

Layfield Environmental Systems Corp.
Layfield Geosynthetics & Ind. Fabrics Ltd.

6. Warranty

Products sold will meet Layfield's published specifications at time of sale. Full warranty details are available from Layfield.

7. Filing Systems

www.LayfieldGroup.com
www.geomembranes.com

8. Material Properties

20 Dec 2011	VaporFlex® Material Properties[1]			
Test	ASTM	Class A Requirements[2]	VaporFlex® 15	VaporFlex® 10
Thickness(Nominal)	D5199	N/A	15 mil 0.375 mm	10 mil 0.250 mm
Baseline Water Vapor Permeance	E154 Section 7	0.30 Perms	0.020 Perms	0.044 Perms
Permeance after Wetting Drying and Soaking	E154 Section 8	0.30 Perms	0.050 Perms	0.057 Perms
Tensile Strength After Soaking	E154 Section 9	45 ppi[3]	64.9 ppi	62 ppi
Resistance to Puncture	E154 Section 10	2200 grams	2968 grams	3500 grams
Resistance to Plastic Flow & Elevated Temperature	E154 Section 11	0.30 Perms	0.026 Perms	0.067 Perms
Effect of Low Temperature Bending	E154 Section 12	0.30 Perms	0.038 Perms	0.068 Perms
Resistance to Organisms and Substrates in Contact	E154 Section 13	0.30 Perms	0.044 Perms	0.073 Perms
Roll Dimensions			12’ x 150’	15’ x 196’

(1) Properties tested by the CTT Group, not intended as minimum properties.
(2) The requirements of a Class A vapor retarder according to ASTM E1745.
(3) ppi = pounds (force)/inch width

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APPENDIX D

LABORATORY ANALYTICAL REPORT AND ADEC DATA CHECKLISTS

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Contaminated Sites Program
Spill Prevention and Response Division
Alaska Department of Environmental Conservation

Laboratory Data Review Checklist for Air Samples

Completed by: Ben Martich

Title: Senior Scientist   Date: 11/25/14

CS Report Name: VAPOR INTRUSION MITIGATION INSTALLATION REPORT - DRAFT 4TH AND GAMBELL   Report Date: 12/5/14

Consultant Firm: Geosyntec Consultants on behalf of Ahtna Engineering Services

Laboratory Name: ALS   Laboratory Report Number: P1402171

DEC File Number: 2100.38.434   DEC Haz ID: 4084

1. Laboratory
   a. Did a NELAP-certified laboratory receive and perform all of the submitted sample analyses?
      ☑ Yes ☐ No ☐ N/A (Please explain.)

   Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses NELAP-approved?
      ☐ Yes ☐ No ☑ N/A (Please explain.)

   Comments:

2. Chain of Custody (COC)
   a. Was the COC information completed, signed and dated (including released/received by)?
      ☑ Yes ☐ No ☐ N/A (Please explain.)

   Comments:

   b. Was the correct analyses requested?
      ☑ Yes ☐ No ☐ N/A (Please explain.)

   Comments:

3. Laboratory Sample Receipt Documentation

   a. Was the sample condition documented? Were samples collected in gas-tight, opaque/dark Summa canisters or other DEC-approved containers? Was the canister vacuum/pressure checked, recorded upon receipt and were there no open valves?

      ☑ Yes ☐ No ☐ N/A (Please explain.)

   Comments:

   b. If there were any discrepancies, were they documented? Examples include incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, canister not holding a vacuum, etc.

      ☑ Yes ☐ No ☐ N/A (Please explain.)

   Comments:

   Canister for sample 14-4G-111-IA had positive pressure, which corroborates with final field reading following 24-hours of sampling

   c. Was the data quality or usability affected? (Please explain.)

   Comments:

   Detected results for 14-4G-111-IA flagged with "J" as estimated results with unknown bias

4. Case Narrative

   a. Is there a case narrative and is it understandable?

      ☑ Yes ☐ No ☐ N/A (Please explain.)

   Comments:

   b. Were there any discrepancies, errors or QC failures identified by the lab?

      ☐ Yes ☑ No ☐ N/A (Please explain.)

   Comments:

   c. Were all corrective actions documented?

      ☐ Yes ☐ No ☑ N/A (Please explain.)

   Comments:

   d. What is the effect on data quality/usability according to the case narrative?

   Comments:

   No effects

5. Samples Results
   a. Was the correct analyses performed/reported as requested on COC?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

   b. Were the samples analyzed within 30 days of collection or within the time required by the method?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

   c. Are the reported PQLs less than the Target Screening Level or the minimum required detection level for the project?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

   d. Was the data quality or usability affected?

   Comments:

   No

6. QC Samples
   a. Method Blank
      i. Was one method blank reported per analysis and 20 samples?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

      ii. Were all method blank results less than PQL?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

      iii. If above PQL, what samples are affected?

   Comments:

   NA

iv. Do the affected sample(s) have data flags and, if so, are the data flags clearly defined?
☐ Yes ☐ No ☐ N/A (Please explain.)

Comments:

NA

v. Was the data quality or usability affected? (Please explain.)

Comments:

NA

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Was there one LCS/LCSD or one LCS and a sample/sample duplicate pair reported per analysis and 20 samples?
☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

ii. Accuracy – Were all percent recoveries (%R) reported and within method or laboratory limits? What were the project specified DQOs, if applicable?
☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

iii. Precision – Were all relative percent differences (RPD) reported and were they less than method or laboratory limits? What were the project-specified DQOs, if applicable.
☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

iv. If the %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

NA

v. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
☐ Yes ☐ No ☑ N/A (Please explain.)

Comments:

vi. Is the data quality or usability affected? (Please explain.)

Comments:

No

c. Surrogates

i. Are surrogate recoveries reported for field, QC and laboratory samples?

☑Yes ☐No ☐N/A (Please explain.)

Comments:

ii. Accuracy – Are all percent recoveries (%R) reported and within method or laboratory limits? What were the project-specified DQOs, if applicable?

☑Yes ☐No ☐N/A (Please explain.)

Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☐Yes ☐No ☑N/A (Please explain.)

Comments:

iv. Was the data quality or usability affected? (Please explain.)

Comments:

No

d. Field Duplicate

i. Was one field duplicate submitted per analysis and 10 type (soil gas, indoor air, etc.) samples?

☑Yes ☐No ☐N/A (Please explain.)

Comments:

ii. Were they or was it submitted blind to the lab?

☑Yes ☐No ☐N/A (Please explain.)

Comments:

iii. Precision – Were all relative percent differences (RPD) less than the specified DQOs? (Recommended: 25 %)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐ Yes ☑ No ☐ N/A (Please explain.)

Comments:

PCE not within 25%

iv. Was the data quality or usability affected? (Please explain.)

Comments:

PCE result already flagged as estimated based on positive pressure in canister. Result is estimated but usable

e. Field Blank (If not used, explain why.)

☐ Yes ☐ No ☑ N/A (Please explain.)

Comments:

i. Were all results less than the PQL?

☐ Yes ☐ No ☑ N/A (Please explain.)

Comments:

ii. If above PQL, what samples are affected?

Comments:

NA

iii. Was the data quality or usability affected? (Please explain.)

Comments:

NA

7. Other Data Flags/Qualifiers

a. Were other data flags/qualifiers defined and appropriate?

☐ Yes ☐ No ☑ N/A (Please explain.)

Comments:

Contaminated Sites Program
Spill Prevention and Response Division
Alaska Department of Environmental Conservation

Laboratory Data Review Checklist for Air Samples

Completed by: Ben Martich

Title: Senior Scientist Date: 11/25/14

CS Report Name: VAPOR INTRUSION MITIGATION INSTALLATION REPORT - DRAFT 4TH AND GAMBELL Report Date: 12/5/14

Consultant Firm: Geosyntec Consultants on behalf of Ahtna Engineering Services

Laboratory Name: ALS Laboratory Report Number: P1404470A

DEC File Number: 2100.38.434 DEC Haz ID: 4084

1. Laboratory
   a. Did a NELAP-certified laboratory receive and perform all of the submitted sample analyses?
      ☑ Yes ☐ No ☐ N/A (Please explain.)

   Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses NELAP-approved?
      ☐ Yes ☐ No ☑ N/A (Please explain.)

   Comments:

2. Chain of Custody (COC)
   a. Was the COC information completed, signed and dated (including released/received by)?
      ☑ Yes ☐ No ☐ N/A (Please explain.)

   Comments:

   b. Was the correct analyses requested?
      ☑ Yes ☐ No ☐ N/A (Please explain.)

   Comments:

3. Laboratory Sample Receipt Documentation
    a. Was the sample condition documented? Were samples collected in gas-tight, opaque/dark Summa canisters or other DEC-approved containers? Was the canister vacuum/pressure checked, recorded upon receipt and were there no open valves?

        ☑ Yes ☐ No ☐ N/A (Please explain.)

    Comments:

    b. If there were any discrepancies, were they documented? Examples include incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, canister not holding a vacuum, etc.

        ☑ Yes ☐ No ☑ N/A (Please explain.)

    Comments:

    No issues

    c. Was the data quality or usability affected? (Please explain.)

    Comments:

    NA

4. Case Narrative
    a. Is there a case narrative and is it understandable?

        ☑ Yes ☐ No ☐ N/A (Please explain.)

    Comments:

    b. Were there any discrepancies, errors or QC failures identified by the lab?

        ☐ Yes ☑ No ☐ N/A (Please explain.)

    Comments:

    c. Were all corrective actions documented?

        ☐ Yes ☐ No ☑ N/A (Please explain.)

    Comments:

    d. What is the effect on data quality/usability according to the case narrative?

    Comments:

    No effects

5. Samples Results
   a. Was the correct analyses performed/reported as requested on COC?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

   b. Were the samples analyzed within 30 days of collection or within the time required by the method?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

   c. Are the reported PQLs less than the Target Screening Level or the minimum required detection level for the project?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

   d. Was the data quality or usability affected?

   Comments:

   No

6. QC Samples
   a. Method Blank
      i. Was one method blank reported per analysis and 20 samples?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

      ii. Were all method blank results less than PQL?
      ☑Yes ☐No ☐N/A (Please explain.)

   Comments:

      iii. If above PQL, what samples are affected?

   Comments:

   NA

iv. Do the affected sample(s) have data flags and, if so, are the data flags clearly defined?

☐ Yes ☐ No ☐ N/A (Please explain.)

Comments:

NA

v. Was the data quality or usability affected? (Please explain.)

Comments:

NA

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Was there one LCS/LCSD or one LCS and a sample/sample duplicate pair reported per analysis and 20 samples?

☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

ii. Accuracy – Were all percent recoveries (%R) reported and within method or laboratory limits? What were the project specified DQOs, if applicable?

☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

iii. Precision – Were all relative percent differences (RPD) reported and were they less than method or laboratory limits? What were the project-specified DQOs, if applicable.

☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

iv. If the %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

NA

v. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☑ N/A (Please explain.)

Comments:

vi. Is the data quality or usability affected? (Please explain.)

Comments:

No

c. Surrogates

i. Are surrogate recoveries reported for field, QC and laboratory samples?

☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

ii. Accuracy – Are all percent recoveries (%R) reported and within method or laboratory limits? What were the project-specified DQOs, if applicable?

☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☑ N/A (Please explain.)

Comments:

iv. Was the data quality or usability affected? (Please explain.)

Comments:

No

d. Field Duplicate

i. Was one field duplicate submitted per analysis and 10 type (soil gas, indoor air, etc.) samples?

☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

ii. Were they or was it submitted blind to the lab?

☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

iii. Precision – Were all relative percent differences (RPD) less than the specified DQOs? (Recommended: 25 %)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☑ Yes ☐ No ☐ N/A (Please explain.)

Comments:

iv. Was the data quality or usability affected? (Please explain.)

Comments:

NA

e. Field Blank (If not used, explain why.)

☐ Yes ☐ No ☑ N/A (Please explain.)

Comments:

i. Were all results less than the PQL?

☐ Yes ☐ No ☑ N/A (Please explain.)

Comments:

ii. If above PQL, what samples are affected?

Comments:

NA

iii. Was the data quality or usability affected? (Please explain.)

Comments:

NA

7. Other Data Flags/Qualifiers

a. Were other data flags/qualifiers defined and appropriate?

☐ Yes ☐ No ☑ N/A (Please explain.)

Comments:

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LABORATORY REPORT

June 5, 2014

Ben Martich
GeoSyntec Consultants
110 West 38th Street, Suite 200A
Anchorage, AK 99503

RE: 4th and Gambell / 20282.02

Dear Ben:

Enclosed are the results of the samples submitted to our laboratory on May 30, 2014. For your reference, these analyses have been assigned our service request number P1402171.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

Kelly Horiuchi
By Kelly Horiuchi at 4:36 pm, Jun 05, 2014

Kelly Horiuchi
Laboratory Director

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T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: GeoSyntec Consultants
Project: 4th and Gambell / 20282.02

Service Request No: P1402171

CASE NARRATIVE

The samples were received intact under chain of custody on May 30, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Volatile Organic Compound Analysis

The samples were analyzed for selected volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. This method is not included on the laboratory's AIHA-LAP scope of accreditation. Any analytes flagged with an X are not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

The Summa canisters were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

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ALS Environmental – Simi Valley

Certifications, Accreditations, and Registrations

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2012039
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	643428
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-13-4
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272013-3
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: GeoSyntec Consultants

Service Request: P1402171

Project ID: 4th and Gambell / 20282.02

Date Received: 5/30/2014

Time Received: 09:30

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	TO-15 - VOC Cans
14-4G-106-IA	P1402171-001	Air	5/28/2014	10:10	AS00107	-2.80	3.62	X
14-4G-108-IA	P1402171-002	Air	5/28/2014	10:25	AC01526	-3.27	3.70	X
14-4G-110-IA	P1402171-003	Air	5/28/2014	10:45	AC01839	-2.96	3.61	X
14-4G-111-IA	P1402171-004	Air	5/28/2014	10:50	AS00145	0.65	3.69	X
14-4G-113-IA	P1402171-005	Air	5/28/2014	11:05	AC01763	-3.77	3.72	X

Air - Chain of Custody Record & Analytical Service Request

Page 1 of 1

ALS
2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No P1402171

ALS Contact:

Company Name & Address (Reporting Information): Geosyntec, 110 W 38th Ave, Ste 200, Anchorage, AK 99503

Project Name: 4th and Gambell

Project Number: 20282.02

Project Manager: Ben Martich

P.O. # / Billing Information: Ahtna Engineering Services, 3100 Beacon Blvd, West Sacramento, CA 95691

Phone: 907-433-0770

Fax:

Email Address for Result Reporting: bmartich@geosyntec.com

Sampler (Print & Sign): Ben Martich

Analysis Method: TO-15 (PCE, TCE, cDCE + DCE, 1,1-DCE, VC)

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	TO-15 (PCE, TCE, cDCE + DCE, 1,1-DCE, VC)		Comments e.g. Actual Preservative or specific instructions
14-4G-106-IA	1 -2.86	5/28/14	1010	4991	F215424	30	7	6 l	X		
14-4G-108-IA	2 -3.29	5/28/14	1025	4192	F220436	30	7	6 l	X		
14-4G-110-IA	3 -2.98	5/28/14	1045	11953	FCA00823	30	7	6 l	X		
14-4G-111-IA	4 +0.65	5/28/14	1050	5018	F221880	30	0	6 l	X		
14-4G-113-IA	5 -3.84	5/28/14	1105	10838	FCA00093	30	8	6 l	X		

Report Tier Levels - please select
Tier I - Results (Default in not specified) ____
Tier II (Results + QC Summaries X
Tier III (Results + QC & Calibration Summaries) ____
Tier IV (Date Validation Package) 10% Surcharge ____

EDD required YES / No
Type: Standard Units: ____

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Ben Martich	5/29/14	1100	[signature]	5/30/14	0930

Cooler / Blank Temperature ____°C

ALS Environmental
Sample Acceptance Check Form

Client: AHTNA Engineering Services, LLC — Work order: P1402171

Project: 4th and Gambell / 20282.02

Sample(s) received on: 5/30/14 — Date opened: 5/30/14 — by: MZAMORA

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by ALS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
6	Was **sample volume** received adequate for analysis?	☒	☐	☐
7	Are samples within specified holding times?	☒	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
9	Was a **trip blank** received?	☐	☒	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? ____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? ____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1402171-001.01	6.0 L Silonite Can					
P1402171-002.01	6.0 L Ambient Can					
P1402171-003.01	6.0 L Ambient Can					
P1402171-004.01	6.0 L Silonite Can					
P1402171-005.01	6.0 L Ambient Can					

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-106-IA** ALS Project ID: P1402171
Client Project ID: **4th and Gambell / 20282.02** ALS Sample ID: P1402171-001

Test Code: EPA TO-15 Date Collected: 5/28/14
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 5/30/14
Analyst: John Rice Date Analyzed: 6/3/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AS00107

Initial Pressure (psig): -2.80 Final Pressure (psig): 3.62

Canister Dilution Factor: 1.54

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.15	ND	0.060	
75-35-4	1,1-Dichloroethene	ND	0.15	ND	0.039	
156-60-5	trans-1,2-Dichloroethene	**0.19**	0.15	**0.049**	0.039	
156-59-2	cis-1,2-Dichloroethene	ND	0.15	ND	0.039	
79-01-6	Trichloroethene	ND	0.15	ND	0.029	
127-18-4	Tetrachloroethene	**66**	0.15	**9.7**	0.023	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-108-IA** ALS Project ID: P1402171
Client Project ID: **4th and Gambell / 20282.02** ALS Sample ID: P1402171-002

Test Code: EPA TO-15 Date Collected: 5/28/14
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 5/30/14
Analyst: John Rice Date Analyzed: 6/3/14
Sample Type: 6.0 L Summa Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AC01526

Initial Pressure (psig): -3.27 Final Pressure (psig): 3.70

Canister Dilution Factor: 1.61

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.16	ND	0.063	
75-35-4	1,1-Dichloroethene	ND	0.16	ND	0.041	
156-60-5	trans-1,2-Dichloroethene	ND	0.16	ND	0.041	
156-59-2	cis-1,2-Dichloroethene	ND	0.16	ND	0.041	
79-01-6	Trichloroethene	ND	0.16	ND	0.030	
127-18-4	Tetrachloroethene	**3.9**	0.16	**0.57**	0.024	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-110-IA** ALS Project ID: P1402171
Client Project ID: **4th and Gambell / 20282.02** ALS Sample ID: P1402171-003

Test Code:	EPA TO-15	Date Collected:	5/28/14
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	5/30/14
Analyst:	John Rice	Date Analyzed:	6/3/14
Sample Type:	6.0 L Summa Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			
Container ID:	AC01839		

Initial Pressure (psig): -2.96 Final Pressure (psig): 3.61

Canister Dilution Factor: 1.56

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
75-01-4	Vinyl Chloride	ND	0.16	ND	0.061	
75-35-4	1,1-Dichloroethene	ND	0.16	ND	0.039	
156-60-5	trans-1,2-Dichloroethene	**0.84**	0.16	**0.21**	0.039	
156-59-2	cis-1,2-Dichloroethene	ND	0.16	ND	0.039	
79-01-6	Trichloroethene	ND	0.16	ND	0.029	
127-18-4	Tetrachloroethene	**78**	0.16	**11**	0.023	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-111-IA**
Client Project ID: **4th and Gambell / 20282.02**

ALS Project ID: P1402171
ALS Sample ID: P1402171-004

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: John Rice
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: AS00145

Date Collected: 5/28/14
Date Received: 5/30/14
Date Analyzed: 6/3/14
Volume(s) Analyzed: 1.00 Liter(s)

Initial Pressure (psig): 0.65 Final Pressure (psig): 3.69

Canister Dilution Factor: 1.20

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.12	ND	0.047	
75-35-4	1,1-Dichloroethene	ND	0.12	ND	0.030	
156-60-5	trans-1,2-Dichloroethene	**0.82**	0.12	**0.21**	0.030	
156-59-2	cis-1,2-Dichloroethene	ND	0.12	ND	0.030	
79-01-6	Trichloroethene	ND	0.12	ND	0.022	
127-18-4	Tetrachloroethene	**53**	0.12	**7.8**	0.018	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-113-IA** — ALS Project ID: P1402171
Client Project ID: **4th and Gambell / 20282.02** — ALS Sample ID: P1402171-005

Test Code: EPA TO-15 — Date Collected: 5/28/14
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 — Date Received: 5/30/14
Analyst: John Rice — Date Analyzed: 6/3/14
Sample Type: 6.0 L Summa Canister — Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AC01763

Initial Pressure (psig): -3.77 Final Pressure (psig): 3.72

Canister Dilution Factor: 1.69

CAS #	Compound	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
75-01-4	Vinyl Chloride	ND	0.17	ND	0.066	
75-35-4	1,1-Dichloroethene	ND	0.17	ND	0.043	
156-60-5	trans-1,2-Dichloroethene	ND	0.17	ND	0.043	
156-59-2	cis-1,2-Dichloroethene	ND	0.17	ND	0.043	
79-01-6	Trichloroethene	ND	0.17	ND	0.031	
127-18-4	Tetrachloroethene	**8.8**	0.17	**1.3**	0.025	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **Method Blank** ALS Project ID: P1402171
Client Project ID: **4th and Gambell / 20282.02** ALS Sample ID: P140603-MB

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: John Rice Date Analyzed: 6/3/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.10	ND	0.039	
75-35-4	1,1-Dichloroethene	ND	0.10	ND	0.025	
156-60-5	trans-1,2-Dichloroethene	ND	0.10	ND	0.025	
156-59-2	cis-1,2-Dichloroethene	ND	0.10	ND	0.025	
79-01-6	Trichloroethene	ND	0.10	ND	0.019	
127-18-4	Tetrachloroethene	ND	0.10	ND	0.015	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

SURROGATE SPIKE RECOVERY RESULTS

Client: **GeoSyntec Consultants**
Client Project ID: **4th and Gambell / 20282.02** ALS Project ID: P1402171

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date(s) Collected: 5/28/14
Analyst: John Rice Date(s) Received: 5/30/14
Sample Type: 6.0 L Silonite Canister(s) Date(s) Analyzed: 6/3/14
Test Notes:

		1,2-Dichloroethane-d4	**Toluene-d8**	**Bromofluorobenzene**		
Client Sample ID	**ALS Sample ID**	Percent Recovered	Percent Recovered	Percent Recovered	Acceptance Limits	**Data Qualifier**
Method Blank	P140603-MB	**100**	**98**	**103**	70-130	
Lab Control Sample	P140603-LCS	**97**	**98**	**105**	70-130	
14-4G-106-IA	P1402171-001	**99**	**97**	**103**	70-130	
14-4G-108-IA	P1402171-002	**101**	**97**	**101**	70-130	
14-4G-108-IA	P1402171-002DUP	**99**	**97**	**102**	70-130	
14-4G-110-IA	P1402171-003	**98**	**100**	**102**	70-130	
14-4G-111-IA	P1402171-004	**97**	**99**	**101**	70-130	
14-4G-113-IA	P1402171-005	**97**	**97**	**101**	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **GeoSyntec Consultants**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1402171
Client Project ID: **4th and Gambell / 20282.02** ALS Sample ID: P140603-LCS

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: John Rice Date Analyzed: 6/3/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	**Compound**	Spike Amount μg/m³	**Result μg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
75-01-4	Vinyl Chloride	200	**164**	**82**	64-122	
75-35-4	1,1-Dichloroethene	218	**182**	**83**	69-119	
156-60-5	trans-1,2-Dichloroethene	210	**169**	**80**	70-126	
156-59-2	cis-1,2-Dichloroethene	216	**173**	**80**	70-119	
79-01-6	Trichloroethene	206	**173**	**84**	71-119	
127-18-4	Tetrachloroethene	192	**161**	**84**	63-123	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY DUPLICATE SUMMARY RESULTS

Client:	**GeoSyntec Consultants**		
Client Sample ID:	**14-4G-108-IA**	ALS Project ID:	P1402171
Client Project ID:	**4th and Gambell / 20282.02**	ALS Sample ID:	P1402171-002DUP
Test Code:	EPA TO-15	Date Collected:	5/28/14
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	5/30/14
Analyst:	John Rice	Date Analyzed:	6/3/14
Sample Type:	6.0 L Summa Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			
Container ID:	AC01526		

Initial Pressure (psig): -3.27 Final Pressure (psig): 3.70

Canister Dilution Factor: 1.61

Compound	Sample Result		**Duplicate Sample Result**		Average	**% RPD**	RPD	**Data**
	µg/m³	ppbV	**µg/m³**	ppbV	µg/m³		Limit	**Qualifier**
Vinyl Chloride	ND	ND	ND	ND	-	-	25	
1,1-Dichloroethene	ND	ND	ND	ND	-	-	25	
trans-1,2-Dichloroethene	ND	ND	ND	ND	-	-	25	
cis-1,2-Dichloroethene	ND	ND	ND	ND	-	-	25	
Trichloroethene	ND	ND	ND	ND	-	-	25	
Tetrachloroethene	3.87	0.571	3.88	0.573	3.875	**0.3**	25	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

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LABORATORY REPORT

November 24, 2014

Olga Stewart
AHTNA Engineering Services, LLC
560 E. 34th Ave. Suite 101
Anchorage, AK 99503

RE: Fourth & Gambell / 20282.02

Dear Olga:

Your report number P1404470 has been amended for the samples submitted to our laboratory on October 31, 2014. The amended report includes 1,1-DCE. The added pages have been indicated by the "Added Page" footer located at the bottom right of the page.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

Kelly Horiuchi
By Kelly Horiuchi at 4:19 pm, Nov 24, 2014

Kelly Horiuchi
Laboratory Director

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www.alsglobal.com

Client: AHTNA Engineering Services, LLC
Project: Fourth & Gambell / 20282.02

Service Request No: P1404470

CASE NARRATIVE

The samples were received intact under chain of custody on October 31, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Volatile Organic Compound Analysis

The samples were analyzed for selected volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. This method is not included on the laboratory's AIHA-LAP scope of accreditation. Any analytes flagged with an X are not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

The Summa canisters were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	643428
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272014-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: AHTNA Engineering Services, LLC

Service Request: P1404470

Project ID: Fourth & Gambell / 20282.02

Date Received: 10/31/2014

Time Received: 10:29

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	TO-15 - VOC Cans
14-4G-121-IA	P1404470-001	Air	10/27/2014	14:10	AS00767	-4.43	3.75	X
14-4G-122-IA	P1404470-002	Air	10/27/2014	14:20	AS00781	-2.51	3.64	X
14-4G-123-IA	P1404470-003	Air	10/27/2014	14:35	AS00761	-1.05	3.62	X

Air - Chain of Custody Record & Analytical Service Request

Page 1 of 1

ALS
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Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No P1404470

ALS Contact:

Company Name & Address (Reporting Information): Ahtna Engineering Services, 110 W 38th Ave, Ste 200A, Anchorage, AK 99503

Project Name: 4th and Gambell

Project Number: 20282.02

Project Manager: Olga Stewart

P.O. # / Billing Information:

Phone: 907-297-8039

Fax:

Email Address for Result Reporting: ostewart@ahtna.net / bmartich@geosyntec.com

Sampler (Print & Sign): Ben Martich

Analysis Method: TO-15 PCE, TCE, cDCE, tDCE, 1,1-DCE, VC

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	TO-15 PCE, TCE, cDCE, tDCE, 1,1-DCE, VC		Comments e.g. Actual Preservative or specific instructions
14-46-121-IA	1	10/27/14	1410	17137	004894	28	9	6l	X		-4.68
14-46-122-IA	2	10/27/14	1420	16992	F214086	30	6	6l	X		-2.30
14-46-123-IA	3	10/27/14	1435	16808	005341	26	3	6l	X		-0.83

Report Tier Levels - please select
Tier I - Results (Default in not specified) ____
Tier II (Results + QC Summaries X
Tier III (Results + QC & Calibration Summaries) ____
Tier IV (Date Validation Package) 10% Surcharge ____

EDD required YES / No
Type: ____ Units: ____

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
B. Martich	10/28/14	0900	[signature]	10/31/14	1029

Cooler / Blank Temperature ____°C

ALS Environmental
Sample Acceptance Check Form

Client: AHTNA Engineering Services, LLC   Work order: P1404470

Project: Fourth & Gambell / 20282.02

Sample(s) received on: 10/31/14   Date opened: 10/31/14   by: KKELPE

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by ALS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
6	Was **sample volume** received adequate for analysis?	☒	☐	☐
7	Are samples within specified holding times?	☒	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
9	Was a **trip blank** received?	☐	☒	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? ______ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? ______ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **<u>VOA vials</u>** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	☐	☐	☒
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1404470-001.01	6.0 L Silonite Can					
P1404470-002.01	6.0 L Silonite Can					
P1404470-003.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): ______

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **AHTNA Engineering Services, LLC**
Client Sample ID: **14-4G-121-IA** ALS Project ID: P1404470
Client Project ID: **Fourth & Gambell / 20282.02** ALS Sample ID: P1404470-001

Test Code: EPA TO-15 Date Collected: 10/27/14
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 10/31/14
Analyst: Simon Cao Date Analyzed: 11/11/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AS00767

Initial Pressure (psig): -4.43 Final Pressure (psig): 3.75

Canister Dilution Factor: 1.80

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.18	ND	0.070	
156-60-5	trans-1,2-Dichloroethene	ND	0.18	ND	0.045	
156-59-2	cis-1,2-Dichloroethene	ND	0.18	ND	0.045	
79-01-6	Trichloroethene	ND	0.18	ND	0.034	
127-18-4	Tetrachloroethene	**1.6**	0.18	**0.24**	0.027	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **AHTNA Engineering Services, LLC**
Client Sample ID: **14-4G-122-IA**
Client Project ID: **Fourth & Gambell / 20282.02**

ALS Project ID: P1404470
ALS Sample ID: P1404470-002

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: AS00781

Date Collected: 10/27/14
Date Received: 10/31/14
Date Analyzed: 11/11/14
Volume(s) Analyzed: 1.00 Liter(s)

Initial Pressure (psig): -2.51 Final Pressure (psig): 3.64

Canister Dilution Factor: 1.50

CAS #	Compound	Result $\mu g/m^3$	MRL $\mu g/m^3$	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.15	ND	0.059	
156-60-5	trans-1,2-Dichloroethene	ND	0.15	ND	0.038	
156-59-2	cis-1,2-Dichloroethene	ND	0.15	ND	0.038	
79-01-6	Trichloroethene	ND	0.15	ND	0.028	
127-18-4	Tetrachloroethene	**1.7**	0.15	**0.24**	0.022	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **AHTNA Engineering Services, LLC**
Client Sample ID: **14-4G-123-IA** ALS Project ID: P1404470
Client Project ID: **Fourth & Gambell / 20282.02** ALS Sample ID: P1404470-003

Test Code: EPA TO-15 Date Collected: 10/27/14
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 10/31/14
Analyst: Simon Cao Date Analyzed: 11/12/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.50 Liter(s)
Test Notes:
Container ID: AS00761

Initial Pressure (psig): -1.05 Final Pressure (psig): 3.62

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.27	ND	0.10	
156-60-5	trans-1,2-Dichloroethene	ND	0.27	ND	0.068	
156-59-2	cis-1,2-Dichloroethene	ND	0.27	ND	0.068	
79-01-6	Trichloroethene	**0.65**	0.27	**0.12**	0.050	
127-18-4	Tetrachloroethene	**2.6**	0.27	**0.38**	0.040	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **AHTNA Engineering Services, LLC**
Client Sample ID: **Method Blank** ALS Project ID: P1404470
Client Project ID: **Fourth & Gambell / 20282.02** ALS Sample ID: P141111-MB

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 11/11/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.10	ND	0.039	
156-60-5	trans-1,2-Dichloroethene	ND	0.10	ND	0.025	
156-59-2	cis-1,2-Dichloroethene	ND	0.10	ND	0.025	
79-01-6	Trichloroethene	ND	0.10	ND	0.019	
127-18-4	Tetrachloroethene	ND	0.10	ND	0.015	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **AHTNA Engineering Services, LLC**
Client Sample ID: **Method Blank** ALS Project ID: P1404470
Client Project ID: **Fourth & Gambell / 20282.02** ALS Sample ID: P141112-MB

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 11/12/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.10	ND	0.039	
156-60-5	trans-1,2-Dichloroethene	ND	0.10	ND	0.025	
156-59-2	cis-1,2-Dichloroethene	ND	0.10	ND	0.025	
79-01-6	Trichloroethene	ND	0.10	ND	0.019	
127-18-4	Tetrachloroethene	ND	0.10	ND	0.015	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

SURROGATE SPIKE RECOVERY RESULTS

Client: **AHTNA Engineering Services, LLC**
Client Project ID: **Fourth & Gambell / 20282.02**
ALS Project ID: P1404470

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Silonite Canister(s)
Test Notes:

Date(s) Collected: 10/27/14
Date(s) Received: 10/31/14
Date(s) Analyzed: 11/11 - 11/12/14

Client Sample ID	ALS Sample ID	1,2-Dichloroethane-d4 Percent Recovered	Toluene-d8 Percent Recovered	Bromofluorobenzene Percent Recovered	Acceptance Limits	Data Qualifier
Method Blank	P141111-MB	**96**	**102**	**101**	70-130	
Method Blank	P141112-MB	**96**	**103**	**103**	70-130	
Lab Control Sample	P141111-LCS	**98**	**102**	**102**	70-130	
Lab Control Sample	P141112-LCS	**96**	**102**	**104**	70-130	
14-4G-121-IA	P1404470-001	**97**	**101**	**102**	70-130	
14-4G-122-IA	P1404470-002	**96**	**100**	**101**	70-130	
14-4G-123-IA	P1404470-003	**96**	**86**	**92**	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **AHTNA Engineering Services, LLC**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Fourth & Gambell / 20282.02**

ALS Project ID: P1404470
ALS Sample ID: P141111-LCS

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/11/14
Volume(s) Analyzed: 0.125 Liter(s)

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
75-01-4	Vinyl Chloride	202	**189**	**94**	61-127	
156-60-5	trans-1,2-Dichloroethene	212	**227**	**107**	69-123	
156-59-2	cis-1,2-Dichloroethene	214	**219**	**102**	69-119	
79-01-6	Trichloroethene	208	**219**	**105**	69-115	
127-18-4	Tetrachloroethene	198	**212**	**107**	67-120	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **AHTNA Engineering Services, LLC**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Fourth & Gambell / 20282.02**

ALS Project ID: P1404470
ALS Sample ID: P141112-LCS

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/12/14
Volume(s) Analyzed: 0.125 Liter(s)

CAS #	**Compound**	Spike Amount μg/m³	**Result μg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
75-01-4	Vinyl Chloride	202	**169**	**84**	61-127	
156-60-5	trans-1,2-Dichloroethene	212	**212**	**100**	69-123	
156-59-2	cis-1,2-Dichloroethene	214	**204**	**95**	69-119	
79-01-6	Trichloroethene	208	**212**	**102**	69-115	
127-18-4	Tetrachloroethene	198	**208**	**105**	67-120	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

Client: **AHTNA Engineering Services, LLC**
Client Project ID: **Fourth & Gambell / 20282.02** ALS Project ID: P1404470

1,1-Dichloroethene

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Silonite Canister(s)
Test Notes:

Date(s) Collected: 10/27/14
Date Received: 10/31/14
Date Analyzed: 11/11 - 11/12/14

Client Sample ID	ALS Sample ID	Injection Volume Liter(s)	Canister Dilution Factor	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
14-4G-121-IA	P1404470-001	1.00	1.80	ND	0.18	ND	0.045	
14-4G-122-IA	P1404470-002	1.00	1.50	ND	0.15	ND	0.038	
14-4G-123-IA	P1404470-003	0.50	1.34	ND	0.27	ND	0.068	
Method Blank	P141111-MB	1.00	1.00	ND	0.10	ND	0.025	
Method Blank	P141112-MB	1.00	1.00	ND	0.10	ND	0.025	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Added Page

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **AHTNA Engineering Services, LLC**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Fourth & Gambell / 20282.02**

ALS Project ID: P1404470
ALS Sample ID: P141111-LCS

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/11/14
Volume(s) Analyzed: 0.125 Liter(s)

CAS #	**Compound**	Spike Amount μg/m³	**Result μg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
75-35-4	1,1-Dichloroethene	214	**221**	**103**	70-114	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

Added Page

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **AHTNA Engineering Services, LLC**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Fourth & Gambell / 20282.02**

ALS Project ID: P1404470
ALS Sample ID: P141112-LCS

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/12/14
Volume(s) Analyzed: 0.125 Liter(s)

CAS #	**Compound**	Spike Amount μg/m³	**Result μg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
75-35-4	1,1-Dichloroethene	214	**210**	**98**	70-114	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

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APPENDIX E

MONITORING, MAINTENANCE AND REPAIR PLANS

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FOURTH AND GAMBELL SITE

VAPOR MITIGATION SYSTEMS
MONITORING, MAINTENANCE, AND
REPAIR PLANS

710 EAST THIRD AVENUE
720 EAST THIRD AVENUE
736 EAST THIRD AVENUE – NORTH DUPLEX
736 EAST THIRD AVENUE – SOUTH DUPLEX

DECEMBER 5, 2014

Prepared By:

Ahtna Engineering Services, LLC
110 West 38th Avenue, Suite 200A
Anchorage, Alaska 99503

and

ResCon Alaska, LLC
1120 Huffman Road, Suite 24-431
Anchorage, Alaska 99515

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VAPOR MITIGATION SYSTEM MONITORING, MAINTENANCE, AND REPAIR PLAN

710 EAST THIRD AVENUE

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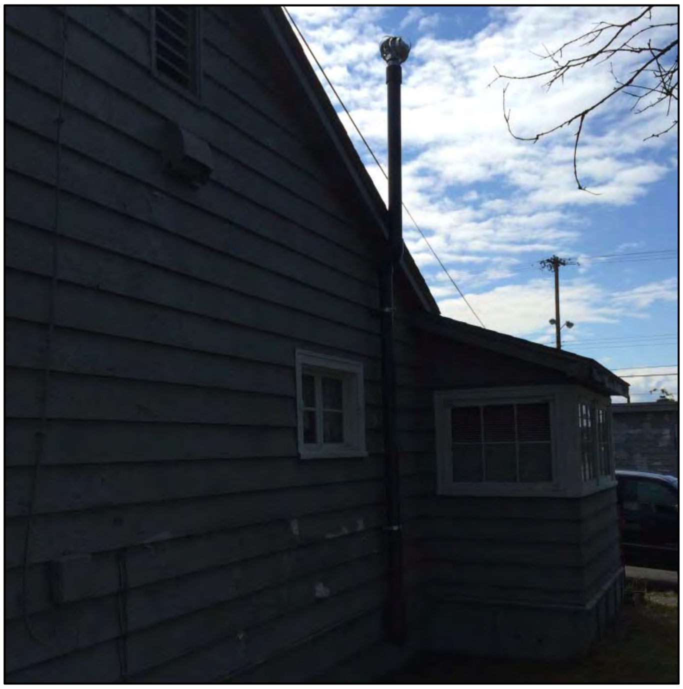
710 EAST THIRD AVENUE VAPOR MITIGATION SYSTEM

The vapor mitigation system at 710 East 3rd Avenue is a passive system consisting of plastic vapor barrier in the crawlspace areas installed over perforated vent piping. Additionally, three 2-inch diameter sub-slab vapor wells are installed through the floor of the basement area. The perforated piping and the vapor wells are connected to 4-inch diameter conveyance piping that leads to exhaust stacks on the east and west side of the structure. A site diagram of the system is shown at the end of this plan.

The vapor barrier is secured to the concrete walls of the crawlspace using a vapor barrier tape and plastic anchor plugs and is designed to seal the structure off from the contaminant vapors in the soil. The perforated piping was installed beneath the vapor barrier in the crawlspaces to remove accumulated volatile contaminants that build up beneath the barrier as shown in Photograph 1.

Photograph 1: Vapor barrier in crawlspace with wooden framing over the plastic barrier and the perforated piping to enable storage in the crawlspace area.

Wind-driven ventilation fans were installed on top of the exhaust stacks to draw the contaminant vapors into the depressurization lines as shown in Photograph 2.



Photograph 2: Exhaust stack piping on west side of the residential building.

Quarterly Inspection

The system should be inspected quarterly for indications of damage to the vapor barriers, the indoor piping or exhaust stacks. The quarterly monitoring should include:

- Inspection of the vapor barrier for tears or holes or indications that the barrier is peeling away from the concrete walls.
- Inspection of the vapor barrier for puddles that could form on top of the liner material from leaks to the home water or drain line piping. Standing water can overtime breakdown the vapor barrier tape along the liner seams, thereby opening up an entry point for contaminant vapors into the building.
- Inspection of the exhaust stacks and ventilation fans on the exterior of the structure for any indications of damage. Verify that the wind turbines are spinning during windy conditions. Note any growling or rattling noise coming from the turbines.

Biannual Maintenance

At the base of the exhaust stacks on each side of the building is a drain plug installed to drain condensate or precipitation that accumulates in the piping. The following biannual maintenance should be performed to maintain the system:

- Open the drain valves at the base of the exhaust stack twice a year in the spring and fall during non-freezing temperatures to remove any condensation or precipitation from the exhaust piping.

Care

The property owner/facility manager should minimize disturbance to the vapor barrier liner. In order to maintain the vapor barrier in good working condition, the owner should:

- Avoid placing heavy and/or sharp objects on the liner.
- Repair all water and drain line leaks in a timely manner, cleaning up any standing water on the liner created by the leaks.
- Avoid accessing the crawlspace with the exception of performing system monitoring events and/or repairs.

Sampling Every Two Years

It is recommended that indoor air sampling for contaminants of concern be performed every two years by an environmental contractor to ensure continued successful operation of the vapor intrusion mitigation system.

The following sampling and analysis plan may be provided to an environmental contractor to ensure the collection of representative indoor air samples.

Analytical Program

The indoor air sample should be collected in a 100%-certified, 6-liter stainless steel Summa canister and analyzed by Environmental Protection Agency method TO-15 for tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethen (tDCE), and vinyl chloride. The sample should be collected over a 24-hour indoor period using a flow controller. The analysis of the sample should be performed by a laboratory that is part of the National Environmental Laboratory Accreditation Program.

Sample Locations

The indoor air sample should be collected from the basement of the building in a centrally located area that has minimal influence from features with increased air exchange (e.g., near an exterior door or window).

Sample Collection

The following actions should be performed prior to sampling:

1. Minimize sampling error by avoiding actions that could cause sample interference such as: fueling vehicles, using permanent ink marking pens, or wearing perfume or cologne in vicinity of the samples.
2. Measure the initial vacuum of the canister. Any canister containing an initial vacuum of less than 25 inches of mercury (in. Hg) will not be utilized and will be replaced during the sampling event.

3. Perform a leak detection test if the canister and flow controller by capping the inlet of the flow controller and opening the canister valve a half-turn and then closing the canister valve.
4. Verify for one minute that the canister and flow controller holds vacuum.
5. If the canister and flow controller do not hold vacuum, then refit or tighten connections and repeat leak detection test.
6. After a successful leak detection test, uncap the inlet of flow controller, open the canister valve a half-turn, and begin the sample collection period.
7. Record the start time, date, initial vacuum, regulator serial number and canister ID on the canister tag, the field notes and the laboratory chain of custody form.
8. Monitor sample progress periodically.
9. At the completion of the 24-hour sampling period, close the valve on the canister, hand-tight.
10. The canisters should be retrieved prior to being completely filled to enable comparison of the residual vacuum level at the end of the sample collection with the vacuum measured upon receipt to the lab for quality control purposes.
11. Record the final vacuum on the canister tag, field notes and chain of custody form.
12. Submit the samples to the analytical laboratory in accordance with chain of custody procedures.

Data Quality

Laboratory data should be reviewed using ADEC's *Laboratory Data Review Checklist for Air Samples*.

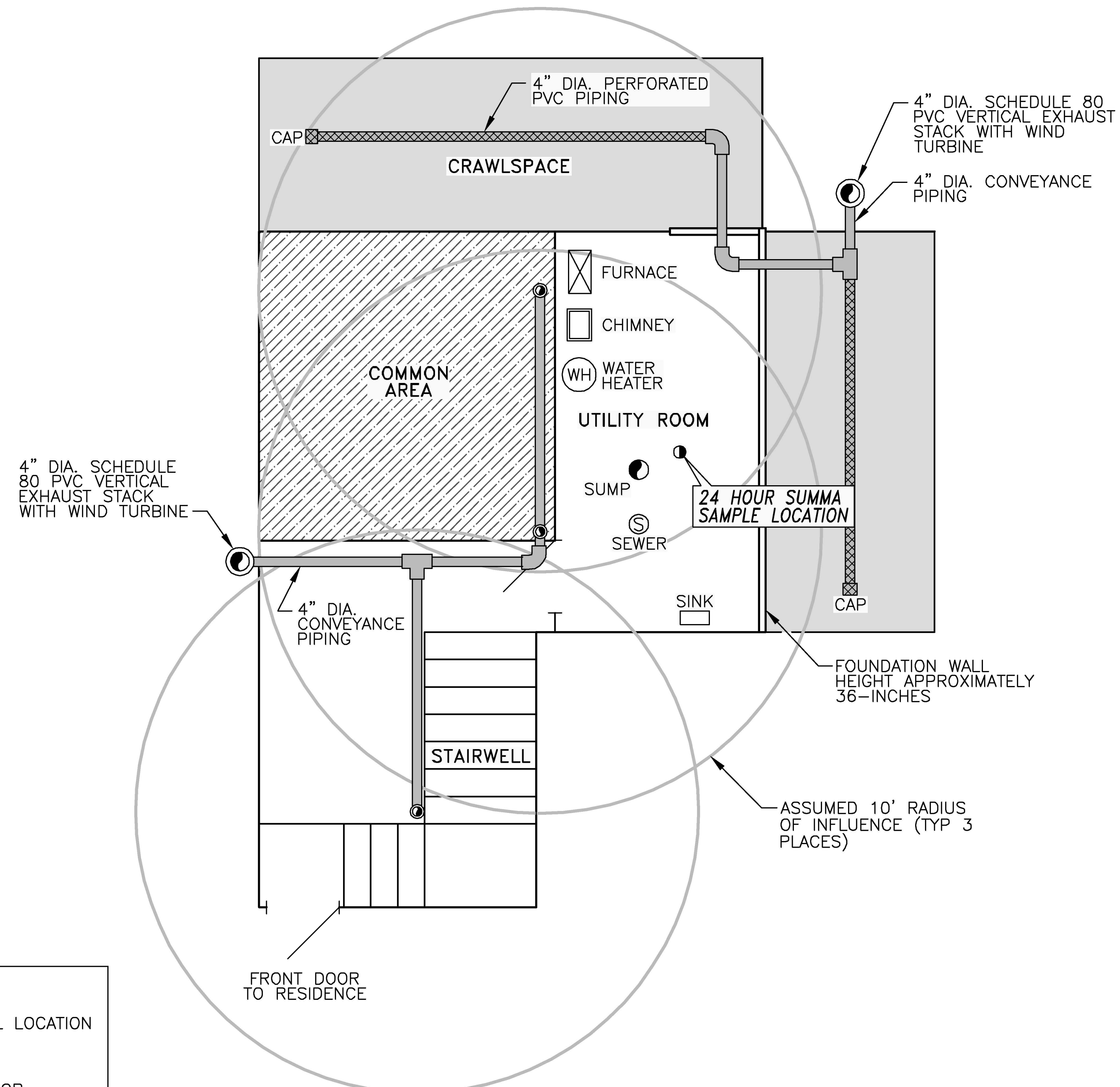
Data Evaluation

Analytical results should be compared to the ADEC Target Levels for Residential Indoor Air as listed in the ADEC Vapor Intrusion Guidance for Contaminated Sites. As of December 2014, the indoor air target levels are:

ADEC TARGET LEVELS FOR RESIDENTIAL INDOOR AIR

Contaminant	Cleanup Level (μg/m^3)
PCE	42
TCE	2.0
cDCE	7.3
tDCE	63
1,1-DCE	210
VC	1.6

Key:
μg/m^3 = micrograms per cubic meter



LEGEND

- INDOOR AIR SAMPLE LOCATION
- 2" DIAMETER EXTRACTION WELL LOCATION
- VAPOR BARRIER ON SOIL
- AREA WITH WOOD FRAMED FLOOR OVER SOIL
- PERFORATED PVC PIPE
- CONVEYANCE PIPE

NOTE:
VAPOR BARRIER EXTENDS TO TOP OF FOUNDATION WALLS AROUND BUILDING PERIMETER.

0 2.5 5
APPROX. SCALE IN FEET

N

PATH: D:\Project Drawings\2014 Drawings\14 Gambell\14 GAM VIM RPT FILE: 14-GAM-VIM-RPT-F3.DWG PLOTTED: 12/4/14.

FIGURE 3

710 E. 3rd AVENUE - AS-BUILT

VAPOR INTRUSION MITIGATION INSTALLATION REPORT
EPA EMERGENCY AND RAPID RESPONSE SERVICES
4TH AND GAMBELL SITE
Anchorage, Alaska

Ahtna Engineering

DATE: DEC. 2014
REV.: -
CHKD: N.P.O.
DRAWN: C.E.H.
PROJ. No.: 15-001

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FOURTH AND GAMBELL SITE

VAPOR MITIGATION SYSTEM MONITORING, MAINTENANCE, AND REPAIR PLAN

720 EAST THIRD AVENUE

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720 EAST THIRD AVENUE VAPOR MITIGATION SYSTEM

The vapor intrusion mitigation system at 720 East 3rd Avenue is an active system with energized exhaust fans to remove contaminant vapors in the crawlspace and beneath the building. The system consists of plastic vapor barrier in the crawlspace beneath the stairs that covers perforated vent piping. The vapor barrier is secured to the concrete walls of the crawlspace using a vapor barrier tape to seal the structure off from the contaminant vapors in the soil. A 2-inch diameter depressurization well is also installed through the wood storage area on the west side of the stairwell. Three, 2-inch diameter sub-slab vapor wells are installed through the concrete slab in the basement area as shown in Photograph 1.

Photograph 1: One of three 2-inch diameter sub-slab vapor wells in the basement of the building.

The perforated piping and the vapor wells are connected to 4-inch diameter conveyance piping that leads to exhaust stacks on the east and west side of the structure. A diagram of the system is shown at the end of this plan.

A radon style inline exhaust fan was installed on each exhaust pipe to draw contaminant vapors into the mitigation system lines and exhaust them outside the building. Analog manometers were installed on each vertical piping for monitoring the vacuum level at each location, as shown in Photograph 2.

Photograph 2: The U-shaped manometer mounted on a 4-inch vertical pipe in the crawlspace area.

One sub-slab vapor monitoring point was installed through the foundation slab in the basement hallway. The vapor monitoring point is covered by a rug and located near the wall.

Owner Responsibilities

1. Quarterly Inspection

Quarterly inspection of the analog meters should be performed to verify that the systems maintain a vacuum beneath the vapor barrier in the crawlspace and concrete slab in the basement.

- The analog manometers mounted on the exterior of each vertical pipe (see Photograph 2 above) are U-shaped graduated tubes filled with red indicator oil. The manometers measure the vacuum that is being drawn by operation of the exhaust fans. One side of the U-tube is connected via flexible tubing to a hole in the vertical pipes. The height of the red oil on the right hand side of the graduated U-tube measures level of vacuum being drawn on the system in inches of water column (inWC). Any reading above 0 inWC indicates that vacuum is being drawn through the line and the system is working. **If the red oil in the manometer drops to zero, the owner should contact the designated environmental contractor to investigate the failure of the system.**

2. Biannual Maintenance

At the base of the exhaust stacks on each side of the building is a drain plug installed to drain condensate or precipitation that accumulates in the piping. The following biannual maintenance should be performed to maintain the system:

- Open the drain valves at the base of the exhaust stack twice a year in the spring and fall during non-freezing conditions to remove any condensation or precipitation from the exhaust piping.

3. Care

The following measures should be taken to minimize disturbance to the vapor barrier liner in the crawlspace and the above ground piping sections.

- Avoid placing heavy and/or sharp objects on the liner.
- Repair all water and drain line leaks over the vapor barrier in a timely manner, cleaning up any standing water on the plastic liner created by the leaks.
- Avoid accessing the crawlspace with the exception of performing system monitoring events and/or repairs.
- Minimize disturbance to the above ground piping.

Environmental Contractor Responsibilities

It is recommended that biannual monitoring by a designated environmental contractor be performed to ensure sustained and optimal operation of the mitigation system. The biannual monitoring events should be conducted in the winter and summer to evaluate the effects on the system caused by temporal and seasonal variations.

1. Monitoring

A ‘Vapor Mitigation System Data Sheet’ for system monitoring is attached to this plan to record operation and maintenance (O&M) data. The contractor should complete the form during each biannual monitoring event as described below.

- <u>Air Velocity Measurements:</u> A plugged sample port for measuring air velocity was installed on each vertical riser pipe adjacent to the analog manometers. The contractor should record the air velocity in each line on the O&M form using a handheld anemometer.
- <u>Vacuum Measurements:</u> The contractor should record the vacuum reading from each of the analog manometers.
- <u>Sub-Slab Vacuum Measurements:</u> The contractor should measure the vacuum from the sub-slab vapor monitoring point on the floor of the basement hallway using a digital manometer. All measurements should be documented on the O&M form.

- System Optimization: Ball valves were installed on each of the vertical riser pipes. The valves were installed to control the airflow through each line and to balance the airflow between the lines. Following collection of the initial velocity measurements in each of the lines, the contractor should calculate the airflow in the lines to determine if any adjustment is necessary to the valves. If the valve positions are changed, the specific changes along with a second set of velocity and vacuum readings (Final) should be taken and documented on the O&M form.

2. Maintenance

In the event of the failure of one or both of the in-line fans, the environmental contractor should perform the following troubleshooting procedures:

1. Check for System Power Failure: Power is provided for the operation of the inline fans from a hard-wired connection to the breaker panel in the house. A switch for each individual fan is also installed adjacent to the fan location. The contractor should ensure that both the circuit breaker and the blower power switch are in the 'ON' position.
2. Blockage in Exhaust Pipe: If the fan is energized, but the manometer(s) still reads zero, the cause is likely a blockage in the conveyance or exhaust stack piping. If this occurs in the winter, the blockage may be due to snow or ice buildup in the exhaust stack. Blockages caused by ice will likely be temporary and do not need to be removed to avoid damaging the exhaust piping. If loss of vacuum occurs during warm periods of the year, it is likely that some other obstruction (debris, animal nesting, etc) is creating the blockage. A lower than average (or decreasing) reading in the manometer may be an indication that a blockage is forming in the exhaust pipe. To investigate a blockage, the contractor should inspect the exhaust piping outside the building to see if it can be identified and removed.
3. Fan Removal: If the above two troubleshooting procedures do not correct the problem, remove the fan from the exhaust stack for further inspection. Remove the insulation sections above and below the fan. Loosen the rubber collars around the fan fittings and remove the fan. Inspect the fan for blockage and/or electrical failure. Repair or replace the unit as necessary.

3. Sampling Every Two Years

It is recommended that indoor air sampling for contaminants of concern be performed every two years by an environmental contractor to ensure continued successful operation of the vapor intrusion mitigation system.

The following sampling and analysis plan may be used to ensure the collection of representative indoor air samples.

Analytical Program

The indoor air sample should be collected in a 100%-certified, 6-liter stainless steel Summa canister and analyzed by Environmental Protection Agency method

TO-15 for tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethen (tDCE), and vinyl chloride. The sample should be collected over a 24-hour indoor period using a flow controller. The analysis of the sample should be performed by a laboratory that is part of the National Environmental Laboratory Accreditation Program.

Sample Locations

The indoor air sample should be collected from the basement of the building in a centrally located area that has minimal influence from features with increased air exchange (e.g., near an exterior door or window).

Sample Collection

The following actions should be performed prior to sampling:

4. Minimize sampling error by avoiding actions that could cause sample interference such as: fueling vehicles, using permanent ink marking pens, or wearing perfume or cologne in vicinity of the samples.
5. Measure the initial vacuum of the canister. Any canister containing an initial vacuum of less than 25 inches of mercury (in. Hg) will not be utilized and will be replaced during the sampling event.
6. Perform a leak detection test if the canister and flow controller by capping the inlet of the flow controller and opening the canister valve a half-turn and then closing the canister valve.
7. Verify for one minute that the canister and flow controller holds vacuum.
8. If the canister and flow controller do not hold vacuum, then refit or tighten connections and repeat leak detection test.
9. After a successful leak detection test, uncap the inlet of flow controller, open the canister valve a half-turn, and begin the sample collection period.
10. Record the start time, date, initial vacuum, regulator serial number and canister ID on the canister tag, the field notes and the laboratory chain of custody form.
11. Monitor sample progress periodically.
12. At the completion of the 24-hour sampling period, close the valve on the canister, hand-tight.
13. The canisters should be retrieved prior to being completely filled to enable comparison of the residual vacuum level at the end of the sample collection with the vacuum measured upon receipt to the lab for quality control purposes.
14. Record the final vacuum on the canister tag, field notes and chain of custody form.
15. Submit the samples to the analytical laboratory in accordance with chain of custody procedures.

Data Quality

Laboratory data should be reviewed using ADEC's *Laboratory Data Review Checklist for Air Samples*.

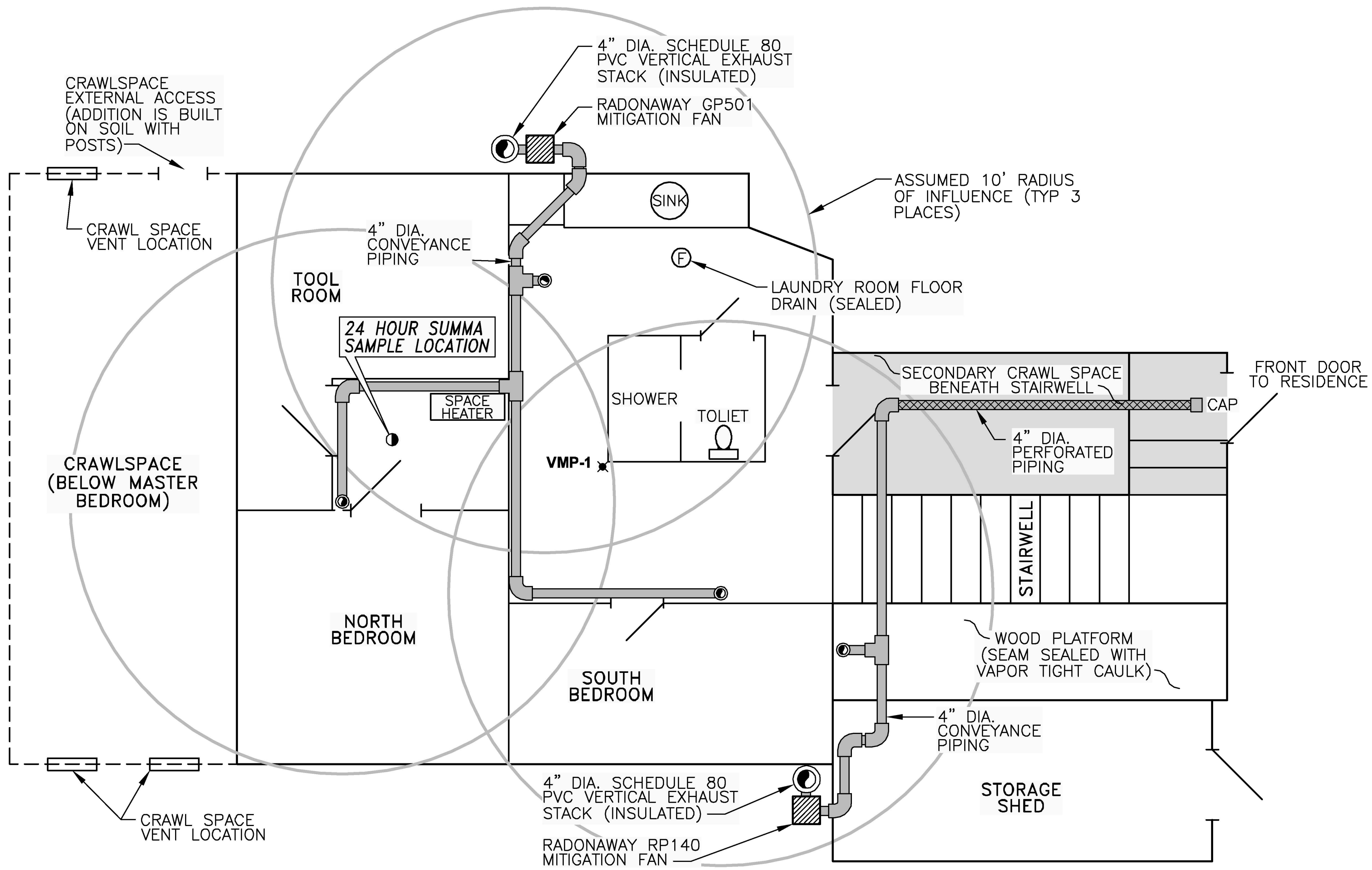
Data Evaluation

Analytical results should be compared to the ADEC Target Levels for Residential Indoor Air as listed in the ADEC Vapor Intrusion Guidance for Contaminated Sites. As of December 2014, the indoor air target levels are:

ADEC TARGET LEVELS FOR RESIDENTIAL INDOOR AIR

Contaminant	Cleanup Level (µg/m^3)
PCE	42
TCE	2.0
cDCE	7.3
tDCE	63
1,1-DCE	210
VC	1.6

Key:
µg/m^3 = micrograms per cubic meter



LEGEND

VMP-1 VAPOR MONITORING POINT LOCATION
INDOOR AIR SAMPLE LOCATION
2" DIAMETER EXTRACTION WELL LOCATION
VAPOR BARRIER ON SOIL
PERFORATED PVC PIPE
CONVEYANCE PIPE

NOTE:
VAPOR BARRIER EXTENDS TO TOP OF FOUNDATION WALLS AROUND BUILDING PERIMETER.

N

0 2.5 5
APPROX. SCALE IN FEET

FIGURE 4

720 E. 3rd AVENUE - AS-BUILT

VAPOR INTRUSION MITIGATION INSTALLATION REPORT
EPA EMERGENCY AND RAPID RESPONSE SERVICES
4TH AND GAMBELL SITE
Anchorage, Alaska

Ahtna Engineering

DATE: DEC. 2014
REV.: –
CHKD: N.P.O.
DRAWN: C.E.H.
PROJ. No.: 15-001

PATH: D:\Project Drawings\2014 Drawings\14 Gambell\14 GAM VIM RPT FILE: 14-GAM-VIM-RPT-F4.DWG PLOTTED: 12/4/14.

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FOURTH AND GAMBELL SITE

VAPOR MITIGATION SYSTEM
MONITORING, MAINTENANCE, AND
REPAIR PLAN

736 EAST THIRD AVENUE – NORTH DUPLEX

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NORTH DUPLEX VAPOR MITIGATION SYSTEM

The vapor mitigation system in the 736 East 3rd Avenue – North Duplex is an active system with energized exhaust fans to remove contaminant vapors in the crawlspace and beneath the concrete basement slab.

The system consists of vapor barrier that covers perforated vent piping in the crawlspace area and two 2-inch diameter sub-slab vapor wells in the basement area. The perforated piping and the vapor wells are connected to 4-inch diameter conveyance piping that leads to exhaust stacks on the east and west side of the structure. The vapor barrier is secured to the concrete perimeter walls of the crawlspace using a vapor barrier tape to seal the structure off from the contaminant vapors in the soil. The perforated piping was installed beneath the vapor barrier in the crawlspaces to remove contaminants that build up beneath the barrier. A vapor blocking epoxy paint was applied to the remaining portion of the sub-grade area including the basement floor and concrete walls. A diagram of the system is provided at the end of this plan.

A radon style inline exhaust fan was installed on the vertical sections of the 4-inch diameter pipes to draw contaminant vapors into the lines and exhaust them outside the building as shown in Photograph 1 below.

Photograph 1: Exhaust pipe with inline fan along east side of crawlspace area.

Analog manometers were installed on each vertical piping for monitoring the vacuum level at each location as shown in Photograph 2.

Photograph 2: Vertical piping from 2-inch sub-slab vapor well in basement area, with mounted U-shaped analog manometer and flow control valve.

Two sub-slab vapor sampling points were installed through the foundation slab in the basement area. The vapor points were covered by stainless steel caps flush with the concrete slab.

Owner Responsibilities

1. Quarterly Inspection

Quarterly inspection of the analog meters should be performed to verify that the systems maintain a vacuum beneath the vapor barrier in the crawlspace and concrete slab in the basement.

- The analog manometers mounted on the exterior of each vertical pipe (see picture above) are U-shaped graduated tubes filled with red indicator oil. The manometers measure the vacuum that is being drawn by operation of the exhaust fans. One side of the U-tube is connected via flexible tubing to a hole in the vertical pipes. The height of the red oil on the right hand side of the graduated U-tube measures level of vacuum being drawn on the system in inches of water column (inWC). Any reading above 0 inWC indicates that vacuum is being drawn through the line and the system is working. **If the red oil in the manometer drops to zero, the owner should contact the designated environmental contractor to investigate the failure of the system.**

2. Biannual Maintenance

At the base of the exhaust stacks on each side of the building is a drain plug installed to drain condensate or precipitation that accumulates in the piping. The following biannual maintenance should be performed to maintain the system:

- Open the drain valves at the base of the exhaust stack twice a year in the spring and fall during non-freezing conditions to remove any condensation or precipitation from the exhaust piping.

3. Care

The following measures should be taken to minimize disturbance to the vapor barrier liner in the crawlspace and the above ground piping sections.

- Avoid placing heavy and/or sharp objects on the liner.
- Repair all water and drain line leaks over the vapor barrier in a timely manner, cleaning up any standing water on the plastic liner created by the leaks.
- Avoid accessing the crawlspace with the exception of performing system monitoring events and/or repairs.
- Minimize disturbance to the above ground piping.

Environmental Contractor Responsibilities

Biannual monitoring of the system by a designated environmental contractor is recommended to ensure sustained and optimal operation of the mitigation system. The biannual monitoring events should be conducted in the winter and summer to evaluate the effects on the system caused by temporal and seasonal variations.

1. Monitoring

A 'Vapor Mitigation System Data Sheet' for system monitoring is attached to this plan to record operation and maintenance (O&M) data. The contractor should complete the form during each biannual monitoring event as described below.

- <u>Air Velocity Measurements:</u> A plugged sample port for measuring air velocity was installed on each vertical riser pipe adjacent to the analog manometers. The contractor should record the air velocity in each line on the O&M form using a handheld anemometer.
- <u>Vacuum Measurements:</u> The contractor should record the vacuum reading from each of the analog manometers.
- <u>Sub-Slab Vacuum Measurements:</u> The contractor should measure the vacuum from the two sub-slab vapor sample points on the floor of the basement using a digital manometer. All measurements should be documented on the O&M form.

- System Optimization: Ball valves were installed on each of the vertical riser pipes. The valves were installed to control the airflow through each line and to balance the airflow between the lines. Following collection of the initial velocity measurements in each of the lines, the contractor should calculate the airflow in the lines to determine if any adjustment is necessary to the valves. If the valve positions are changed, the specific changes along with a second set of velocity and vacuum readings (Final) should be taken and documented on the O&M form.

2. Maintenance

In the event of failure of one or both of the in-line fans, the environmental contractor should perform the following troubleshooting procedures:

16. Check for System Power Failure: Power is provided for the operation of the inline fans from a hard-wired connection to the breaker panel in the house. A switch for each individual fan is also installed adjacent to the fan location. The contractor should ensure that both the circuit breaker and the blower power switch are in the 'ON' position.
17. Blockage in Exhaust Pipe: If the fan is energized, but the manometer(s) still reads zero, the cause is likely a blockage in the conveyance or exhaust stack piping. If this occurs in the winter, the blockage may be due to snow or ice buildup in the exhaust stack. Blockages caused by ice will likely be temporary and do not need to be removed to avoid damaging the exhaust piping. If loss of vacuum occurs during warm periods of the year, it is likely that some other obstruction (debris, animal nesting, etc) is creating the blockage. A lower than average (or decreasing) reading in the manometer may be an indication that a blockage is forming in the exhaust pipe. To investigate a blockage, the contractor should inspect the exhaust piping outside the building to see if it can be identified and removed.
18. Fan Removal: If the above two troubleshooting procedures do not correct the problem, remove the fan from the conveyance piping for further inspection. Remove the insulation sections above and below the fan. Loosen the rubber collars around the fan fittings and remove the fan. Inspect the fan for blockage and/or electrical failure. Repair or replace the unit as necessary.

3. Sampling Every Two Years

It is recommended that indoor air sampling for contaminants of concern be performed every two years by an environmental contractor to ensure continued successful operation of the vapor intrusion mitigation system.

The following sampling and analysis plan may be used to ensure the collection of representative indoor air samples.

Analytical Program

The indoor air sample should be collected in a 100%-certified, 6-liter stainless steel Summa canister and analyzed by Environmental Protection Agency method

TO-15 for tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethen (tDCE), and vinyl chloride. The sample should be collected over a 24-hour indoor period using a flow controller. The analysis of the sample should be performed by a laboratory that is part of the National Environmental Laboratory Accreditation Program.

Sample Locations

The indoor air sample should be collected from the basement of the building in a centrally located area that has minimal influence from features with increased air exchange (e.g., near an exterior door or window).

Sample Collection

The following actions should be performed prior to sampling:

19. Minimize sampling error by avoiding actions that could cause sample interference such as: fueling vehicles, using permanent ink marking pens, or wearing perfume or cologne in vicinity of the samples.
20. Measure the initial vacuum of the canister. Any canister containing an initial vacuum of less than 25 inches of mercury (in. Hg) will not be utilized and will be replaced during the sampling event.
21. Perform a leak detection test if the canister and flow controller by capping the inlet of the flow controller and opening the canister valve a half-turn and then closing the canister valve.
22. Verify for one minute that the canister and flow controller holds vacuum.
23. If the canister and flow controller do not hold vacuum, then refit or tighten connections and repeat leak detection test.
24. After a successful leak detection test, uncap the inlet of flow controller, open the canister valve a half-turn, and begin the sample collection period.
25. Record the start time, date, initial vacuum, regulator serial number and canister ID on the canister tag, the field notes and the laboratory chain of custody form.
26. Monitor sample progress periodically.
27. At the completion of the 24-hour sampling period, close the valve on the canister, hand-tight.
28. The canisters should be retrieved prior to being completely filled to enable comparison of the residual vacuum level at the end of the sample collection with the vacuum measured upon receipt to the lab for quality control purposes.
29. Record the final vacuum on the canister tag, field notes and chain of custody form.
30. Submit the samples to the analytical laboratory in accordance with chain of custody procedures.

Data Quality

Laboratory data should be reviewed using ADEC's *Laboratory Data Review Checklist for Air Samples*.

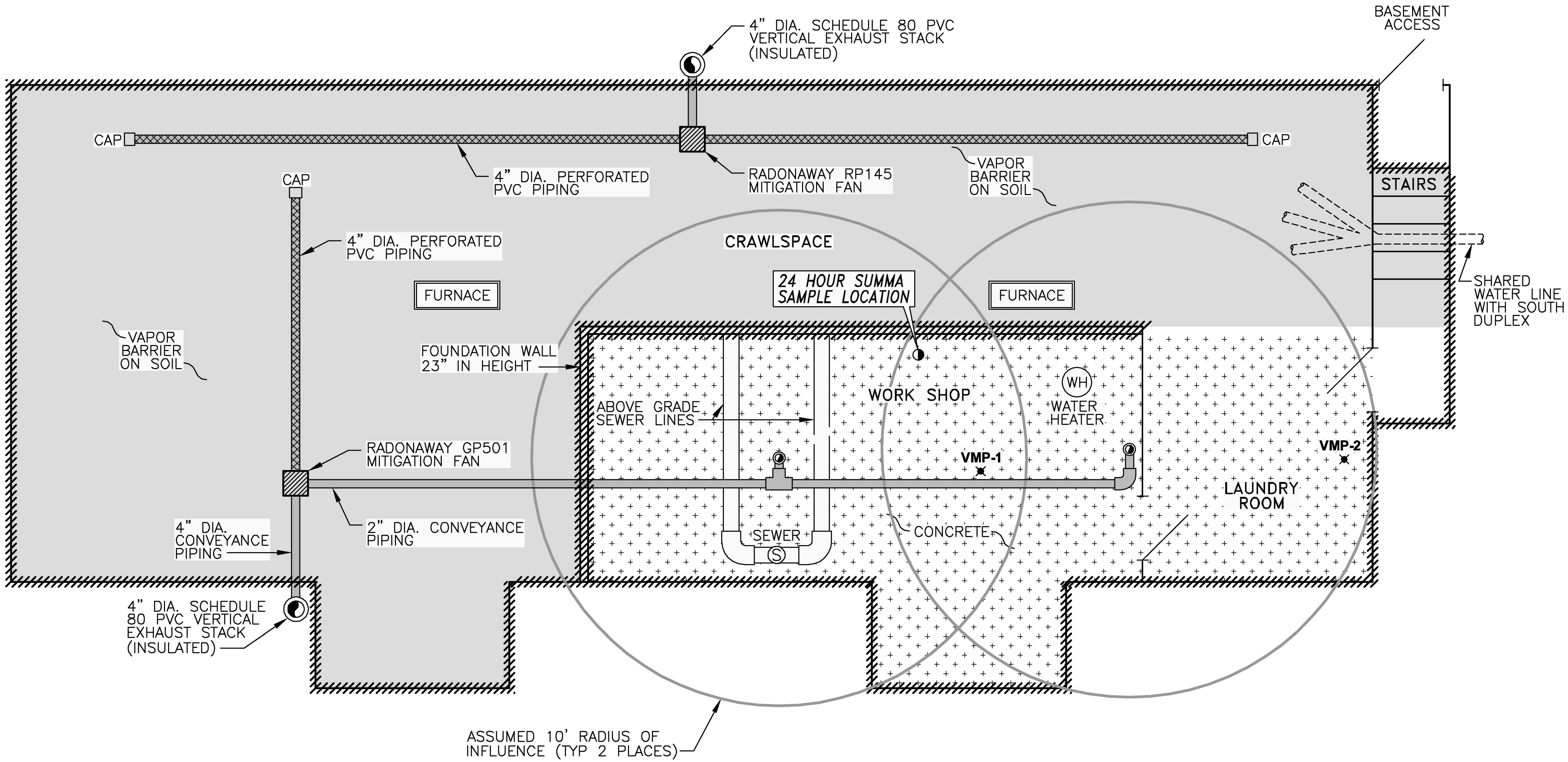
Data Evaluation

Analytical results should be compared to the ADEC Target Levels for Residential Indoor Air as listed in the ADEC Vapor Intrusion Guidance for Contaminated Sites. As of December 2014, the indoor air target levels are:

ADEC TARGET LEVELS FOR RESIDENTIAL INDOOR AIR

Contaminant	Cleanup Level (µg/m^3)
PCE	42
TCE	2.0
cDCE	7.3
tDCE	63
1,1-DCE	210
VC	1.6

Key:
µg/m^3 = micrograms per cubic meter



LEGEND

- VMP-1 — VAPOR MONITORING POINT LOCATION
- INDOOR AIR SAMPLE LOCATION
- 2" DIAMETER EXTRACTION WELL LOCATION
- VAPOR BARRIER ON SOIL
- RETRO–COAT APPLICATION AREA
- FOUNDATION WALLS WHERE RETRO–COAT WILL BE APPLIED
- PERFORATED PVC PIPE
- CONVEYANCE PIPE

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FIGURE 5

736 E. 3rd AVENUE (NORTH DUPLEX) AS-BUILT

VAPOR INTRUSION MITIGATION INSTALLATION REPORT
EPA EMERGENCY AND RAPID RESPONSE SERVICES
4TH AND GAMBELL SITE
Anchorage, Alaska

Ahtna Engineering

DATE: DEC. 2014
REV.: –
CHKD: N.P.O.
DRAWN: C.E.H.
PROJ. No.: 15–001

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FOURTH AND GAMBELL SITE

VAPOR MITIGATION SYSTEM MONITORING, MAINTENANCE, AND REPAIR PLAN

736 EAST THIRD AVENUE – SOUTH DUPLEX

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SOUTH DUPLEX VAPOR MITIGATION SYSTEM

The vapor intrusion mitigation system in the South Duplex is a passive system consisting of two lines of perforated vent piping (sub-membrane depressurization lines) installed beneath a vapor barrier in the building's crawlspace. A diagram of the system layout is shown at the end of this plan.

The vapor barrier is secured to the concrete walls of the crawlspace using a vapor barrier tape and plastic anchor plugs to seal the structure off from the contaminant vapors in the soil. The sub-membrane depressurization lines are constructed of 4-inch diameter perforated PVC piping. The perforated piping was installed beneath the vapor barrier to vent off volatile contaminants that build up beneath the barrier as shown in Photograph 1.

Photograph 1: Plastic vapor barrier encapsulating perforated ventilation piping.

The two lines of perforated piping are located on the west and east sides of the building, extending north to south through the crawlspace. The perforated lines are connected to 4-inch diameter PVC conveyance piping that extends to exterior exhaust stacks on the west and east sides of the structure. Passive wind-driven ventilation fans were installed on top of the exhaust stacks to draw the contaminant vapors out of the building as shown in Photograph 2.

Photograph 2: Exhaust stack piping on the west side of the South Duplex building.

Quarterly Inspection

The system should be inspected quarterly for indications of damage to the vapor barrier, the indoor piping or the exhaust stacks. The crawlspace beneath the building is accessed via an egress well on the east side of the building. The quarterly monitoring tasks include:

- Inspection of the vapor barrier for tears or holes.
- Inspect for indications that the barrier is peeling away from the concrete perimeter walls.
- Inspection of the vapor barrier for puddles that could form on top of the liner material from leaks in the building's water or drain piping. Standing water can breakdown the vapor barrier tape along the liner seams opening up an entry point for contaminant vapors into the building.
- Inspection of the exhaust stacks and ventilation fans on the exterior of the structure for any indications of damage. Verify that the ventilation fans are spinning during windy conditions. Note any growling or rattling noise coming from wind turbine.

Biannual Maintenance

At the base of the exhaust stacks on each side of the building is a drain plug installed to drain condensate or precipitation that accumulates in the exhaust stack. The following biannual maintenance should be performed to maintain the system:

- Open the drain valves at the base of the exhaust stack twice a year in the spring and fall during non-freezing conditions to remove any condensation or precipitation from the exhaust piping.

Care

The property owner/facility manager should minimize disturbance to the vapor barrier liner. In order to maintain the vapor barrier in good working condition, the owner should:

- Avoid placing heavy and/or sharp objects on the liner.
- Repair all water and drain line leaks in a timely manner, removing any standing water.
- Avoid accessing the crawlspace with the exception of system monitoring events and/or repairs.

Sampling Every Two Years

It is recommended that indoor air sampling for contaminants of concern be performed every two years by an environmental contractor to ensure continued successful operation of the vapor intrusion mitigation system.

The following sampling and analysis plan may be provided to an environmental contractor to ensure the collection of representative indoor air samples.

Analytical Program

The indoor air sample should be collected in a 100%-certified, 6-liter stainless steel Summa canister and analyzed by Environmental Protection Agency method TO-15 for tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethen (tDCE), and vinyl chloride. The sample should be collected over a 24-hour indoor period using a flow controller. The analysis of the sample should be performed by a laboratory that is part of the National Environmental Laboratory Accreditation Program.

Sample Locations

The indoor air sample should be collected from the crawl space of the building in a centrally located area that has minimal influence from features with increased air exchange (e.g., near an exterior door or window).

Sample Collection

The following actions should be performed prior to sampling:

31. Minimize sampling error by avoiding actions that could cause sample interference such as: fueling vehicles, using permanent ink marking pens, or wearing perfume or cologne in vicinity of the samples.

32. Measure the initial vacuum of the canister. Any canister containing an initial vacuum of less than 25 inches of mercury (in. Hg) will not be utilized and will be replaced during the sampling event.
33. Perform a leak detection test if the canister and flow controller by capping the inlet of the flow controller and opening the canister valve a half-turn and then closing the canister valve.
34. Verify for one minute that the canister and flow controller holds vacuum.
35. If the canister and flow controller do not hold vacuum, then refit or tighten connections and repeat leak detection test.
36. After a successful leak detection test, uncap the inlet of flow controller, open the canister valve a half-turn, and begin the sample collection period.
37. Record the start time, date, initial vacuum, regulator serial number and canister ID on the canister tag, the field notes and the laboratory chain of custody form.
38. Monitor sample progress periodically.
39. At the completion of the 24-hour sampling period, close the valve on the canister, hand-tight.
40. The canisters should be retrieved prior to being completely filled to enable comparison of the residual vacuum level at the end of the sample collection with the vacuum measured upon receipt to the lab for quality control purposes.
41. Record the final vacuum on the canister tag, field notes and chain of custody form.
42. Submit the samples to the analytical laboratory in accordance with chain of custody procedures.

Data Quality

Laboratory data should be reviewed using ADEC's *Laboratory Data Review Checklist for Air Samples*.

Data Evaluation

Analytical results should be compared to the ADEC Target Levels for Residential Indoor Air as listed in the ADEC Vapor Intrusion Guidance for Contaminated Sites. As of December 2014, the indoor air target levels are:

ADEC TARGET LEVELS FOR RESIDENTIAL INDOOR AIR

Contaminant	Cleanup Level (µg/m^3)
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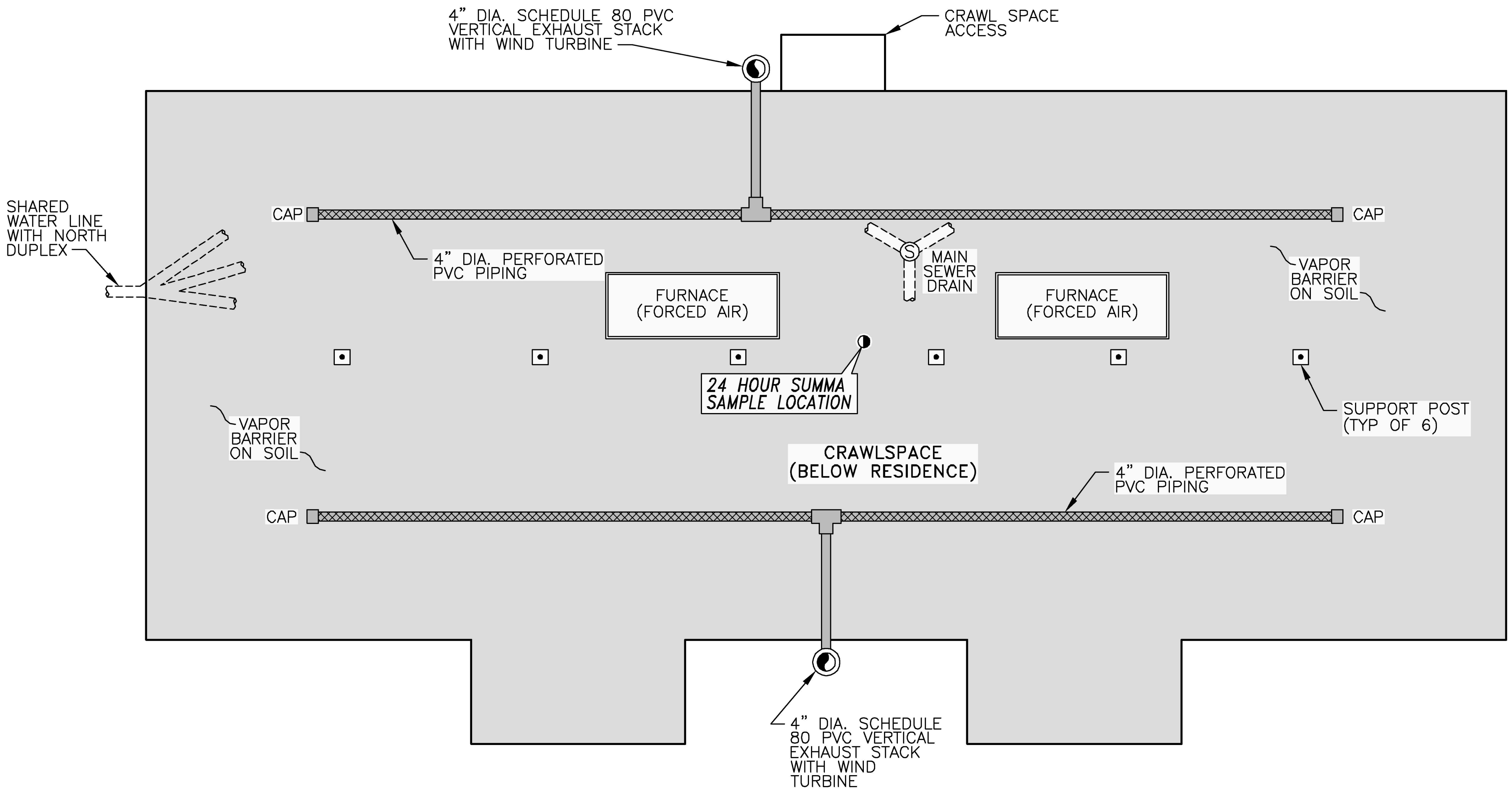

LEGEND

- INDOOR AIR SAMPLE LOCATION
- VAPOR BARRIER ON SOIL
- RETRO-COAT APPLICATION AREA
- FOUNDATION WALLS WHERE RETRO-COAT WILL BE APPLIED
- PERFORATED PVC PIPE
- CONVEYANCE PIPE

NOTE:
VAPOR BARRIER EXTENDS TO TOP OF FOUNDATION WALLS AROUND BUILDING PERIMETER.

N

0 2.5 5
APPROX. SCALE IN FEET

FIGURE 6

736 E. 3rd AVENUE (SOUTH DUPLEX) AS-BUILT

VAPOR INTRUSION MITIGATION INSTALLATION REPORT
EPA EMERGENCY AND RAPID RESPONSE SERVICES
4TH AND GAMBELL SITE
Anchorage, Alaska

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